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A statistical analysis of the effect of the Navy's Tuition Assistance program : do distance learning classes make a difference?

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THESIS

A STATISTICAL ANALYSIS OF THE EFFECT OF THE NAVY'S TUITION ASSISTANCE PROGRAM: DO DISTANCE LEARNING CLASSES MAKE A DIFFERENCE?

by

Jeremy P. McLaughlin

March 2010

Thesis Co-Advisors: Stephen Mehay
Elda Pema

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This thesis analyzes the impact of participation in the Navy's Tuition Assistance (TA) program on the retention of first-term Navy enlisted personnel and the job performance of both first- and second-term Navy enlisted personnel. This thesis estimates the effect of overall TA usage. It also analyzes differential effects of course delivery methods, comparing Distance Learning (DL) with face-to-face classes. Finally, the thesis investigates differences in course completion between DL and non-DL classes. To adjust for selection bias in the course completion and job performance models, the thesis estimates fixed-effects models that net out unobserved individual attributes. In retention models, selection issues are addressed by restricting the sample to recruits with similar motivation at the time of enrollment as TA participants. Data is analyzed for 10 accession cohorts, who entered the Navy between 1994 and 2004, to control for economic or other outside factors that may affect promotion or reenlistment. The analysis indicates that TA students enrolled in DL classes have lower course completion rates and lower grade point averages than sailors enrolled in traditional classes. However, TA students who successfully complete DL classes achieve greater success in terms of job performance. TA students who enroll in either DL or traditional classes tend to reenlist at significantly higher rates than their counterparts who do not use TA.

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This thesis analyzes the impact of participation in the Navy's Tuition Assistance (TA) program on the retention of first-term Navy enlisted personnel and the job performance of both first- and second-term Navy enlisted personnel. This thesis estimates the effect of overall TA usage. It also analyzes differential effects of course delivery methods, comparing Distance Learning (DL) with face-to-face classes. Finally, the thesis investigates differences in course completion between DL and non-DL classes. To adjust for selection bias in the course completion and job performance models, the thesis estimates fixed-effects models that net out unobserved individual attributes. In retention models, selection issues are addressed by restricting the sample to recruits with similar motivation at the time of enrollment as TA participants. Data is analyzed for 10 accession cohorts, who entered the Navy between 1994 and 2004, to control for economic or other outside factors that may affect promotion or reenlistment. The analysis indicates that TA students enrolled in DL classes have lower course completion rates and lower grade point averages than sailors enrolled in traditional classes. However, TA students who successfully complete DL classes achieve greater success in terms of job performance. TA students who enroll in either DL or traditional classes tend to reenlist at significantly higher rates than their counterparts who do not use TA.

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LIST OF SYMBOLS, ACRONYMS, AND/OR ABBREVIATIONS

AFQT	Armed Forces Qualification Test
CNA	Center for Naval Analyses
DL	Distance Learning
DMDC	Defense Manpower Data Center
DoD	Department of Defense
DoDD	Department of Defense Directive
EAOS	Expiration of Active Obligated Service
GED	General Equivalency Diploma
GPA	Grade Point Average
H.S.	High School
IV	Instrumental Variable
ISC	Interservice Separation Code
MOS	Military Occupational Specialty
MOU	Memorandum of Understanding
NCDLP	Navy College Distance Learning Partnerships
NCMIS	Navy Campus Management Information System
NETC	Naval Education and Training Command
OPNAVINST	Office of the Chief of Naval Operations Instruction
OUHK	Open University of Hong Kong
PACE	Program for Afloat College Education
SAT	Scholastic Aptitude Test
SOC	Servicemember's Opportunity Colleges
SRB	Selective Reenlistment Bonus
TA	Tuition Assistance
TIR	Time in Rate
UIC	Unit Identification Code
VOLED	Voluntary Education

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I. INTRODUCTION

A. PURPOSE

This research will examine the effects of participation in the Navy's Tuition Assistance (TA) program on promotion and retention of sailors. In addition, it will explore the effects of Distance Learning (DL) classes on sailor job performance and compare them to the effects of traditional classroom classes to determine if the effect of TA differs by method of instruction. Research will include conducting a detailed analysis of data pertaining to voluntary education, an analysis of the effects of DL on numerous measures of sailor job performance, an in-depth review of the current TA program, and a comparison of the effects of TA participation on promotion of first-term versus second-term sailors.

B. BACKGROUND

The Navy provides 100% tuition reimbursement for sailors who wish to attend college classes in their off-duty time. Previous studies have looked at reenlistment and retention of first-term sailors who use TA. This study will conduct an in-depth analysis of the effects of the Navy's TA program on promotion and retention. It will also analyze whether the method of instruction (DL versus traditional classroom instruction) affects selection for promotion and retention.

The Navy has collaborated with several colleges and universities to offer DL classes, and make it easy for sailors to sign up and use TA. This study will trace the history of these partnership agreements, and examine whether the growth of these partnerships has affected sailors' decisions to enroll in traditional versus DL classes and whether this has contributed to the overall growth in TA program participation.

TA-funded classes are difficult to take during a sailors' first enlistment term because of initial training (Boot Camp) and follow-on training (A-school, C-school, etc.) that may occupy them for their first two years of service. By the time a recruit has reached the Fleet, they may already be eligible for reenlistment. Due to the difficulty of taking TA-funded classes in their first term, this thesis will explore whether the effect of

TA participation differs between sailors in their first and second enlistment terms. In addition, this thesis will investigate differences in participation in DL and traditional classroom instruction among TA users in both the first and second enlistment term, and differences in the effects of these instructional methods between both populations.

C. RESEARCH QUESTIONS

The primary research questions addressed by this thesis are:

- What are the effects of participation in the TA program on promotion and retention of sailors?
- Does the effect of TA on promotion and retention differ by the method of instruction (traditional versus DL)?

The secondary research questions for this thesis are:

- Do the effects of TA participation differ in the first enlistment term versus the second term of service?
- Does the effect of method of instruction (traditional versus DL) differ depending on the enlistment term?
- Do sailors utilizing TA in their second term generally get promoted at higher rates than those in their first term?

D. METHODOLOGY

This thesis will analyze how participation in the TA program affects advancement, promotion, and retention in the Navy. It will also examine differences in promotion and retention by method of instruction (DL versus traditional) and term of service.

First, a complete literature review of books, magazine articles, CD-ROM systems, and other library resources will be conducted to create a baseline of current knowledge on the effects of DL on various measures of civilian student success. This information will be integrated with current research on the Navy's TA program to generate a baseline level of knowledge on how different methods of instruction (DL versus traditional) affect employee performance.

Next, individual as well as cohort, descriptive statistics will be analyzed, based on data obtained from the Defense Manpower Data Center (DMDC) and Navy Education

and Training Command (NETC). This database includes both TA course-level data and demographic data for Navy enlisted personnel from several recruit cohorts.

Multivariate analysis will then be employed to determine the effect of participation in the TA program on promotion, advancement, and retention of sailors. It will be used to further determine if the aforementioned results depend on the method of instruction. Finally, results from first- and second-term sailors will be compared to determine if the effects of TA differ by enlistment term. Finally, recommendations and conclusions will be provided, based on results from the multivariate analysis.

E. SCOPE AND LIMITATIONS

This thesis assumes that the reader understands the basic tenets of the Voluntary Education (VOLED) program; specifically, the TA program. Further, it assumes that the reader has limited knowledge of previous studies of the effects of TA on promotion and retention of sailors in the Navy and will, therefore, review and critique these studies in detail. Although the VOLED program encompasses multiple facets of education—including high school equivalency tests and undergraduate and graduate education—this thesis will focus solely on the TA component. In addition, the sample will be restricted to first- and second-term enlisted sailors entering the Navy between 1994 and 2001 that are pursuing undergraduate education.

F. ORGANIZATION

The remainder of the thesis is organized as follows: Chapter II provides a literature review of human capital theory, the background of the VOLED program, including the implementation of the Navy College Distance Learning Partnerships (NCDLP), and prior research conducted on the Navy's TA program. It will also concentrate on prior studies of the effects of DL on student outcomes.

Chapter III provides estimates of the effect of TA on course success and grade point average GPA by method of instruction. Descriptive statistics of the TA data, provided by the NETC, are discussed in depth. Multivariate models used to estimate the effect of TA by method of instruction are provided with the ensuing results.

Chapter IV outlines the effect of TA by method of instruction on promotion in both the first and second enlistment terms. Construction of the first- and second-term datasets, descriptive statistics for the respective datasets, and multivariate models and results will be discussed in detail. The purpose of this chapter is to determine if the effect of TA on promotion differs by method of instruction and enlistment term.

Chapter V explores the effect of TA by method of instruction on retention in the first term. This chapter provides descriptive statistics, multivariate models, and results of reenlistment as defined by the Interservice Separation Code (ISC) of 1100 in the Enlisted Master File as well as extension past four years without reenlisting. Chapter VI provides a summary of the results, conclusions, and recommendations to the Navy on the current TA program, as well as recommendations for further research in this area.

II. LITERATURE REVIEW

A. WHY DO FIRMS OFFER GENERAL EDUCATION?

This section provides a review and discussion of published literature in six primary areas:

- Incentives for firms to pay for general education.
- The development and implementation of the Department of Defense (DoD) VOLED program.
- Prior research conducted on the Navy TA program.
- The NCDLP.
- Student satisfaction with DL classes.
- The effects of DL on student performance.

Private firms, in general, have little incentive to fund general education for their employees. General education is training that does not necessarily relate to the position held by the employee and it can be transferred to other employers. Funding of general education, therefore, represents a paradox of employers raising the marketability of their employees and increasing their mobility in the job market. In essence, a private firm would be funding the acquisition of transferable skills that would allow an employee to seek higher wages at competing firms.

A range of evidence, however, shows that private firms do fund substantial amounts of general education for their employees. The National Center on Educational Statistics' Adult Education Survey estimates that roughly 24% of adult graduate students receive some TA from their employers, and up to 53% were either receiving tuition support or paid time off from work (Capelli, 2004). The question that must be asked is: why do firms invest in employee's general education?

One answer to this question is that employer-sponsored education is believed to increase employees' organizational commitment. Guffey, West, and White (1997) hypothesize that employer-sponsored education helps increase the employees' affective

commitment1 towards the organization. Firm-sponsored education will strengthen ties between the employer and employee, while generating a feeling of obligation for the employee to stay with the firm, otherwise known as "normative commitment."

Another possible reason for employers to sponsor general education is that it may attract higher quality applicants than other nonwage benefits (Capelli, 2004). Signaling theory states that certain factors, such as age, experience, and education, can indicate an individual's potential productivity level to firms. It follows that if a prospective employee places a higher value on employer-sponsored education as a benefit, they are signaling that they are of a higher ability level than a poorer-quality applicant who places little or no value on additional education (Ehrenberg & Smith, 2009).

Finally, it might be as simple as general education complementing firm-specific training. If the value of the general training increases employees' productivity more in the current firm than competing firms, then the employee is more likely to stay with the current employer than move to a competing firm (Flaherty, 2007). Movement between firms can be costly, both monetarily and psychologically, for employees, so if employer-sponsored general education can increase the employee's value within the firm, they will be less likely to undertake the costs associated with moving between firms.

Although Navy enlisted personnel are generally different from employees working at a private firm, the Navy does provide both firm-specific and general training to its sailors. Therefore, the theories that apply to private firm employees also apply to Navy enlisted personnel. If general education complements firm-specific training, then Navy-sponsored general education may result in higher retention and productivity rates for those sailors who enroll in the TA program, than the sailors who do not. Section B will provide the relevant background on the development and implementation of the DoD VOLED program.

[1] Guffey, West, and White define affective commitment as an employee's emotional ties and involvement with the organization.

B. DEPARTMENT OF DEFENSE (DOD) VOLUNTARY EDUCATION (VOLED) PROGRAM

Annually, the DoD provides about 300,000 service members with funding to enroll in postsecondary education courses leading to associate, bachelor's, master's, and doctoral degrees in their off-duty time. This program constitutes one of the largest continuing education programs in the world (DoD Voluntary Education Program, 2003). DoD Directive (DoDD) 1322.8E states that:

> Voluntary education programs shall provide educational opportunities comparable to those available to citizens outside the military, be available to all active duty personnel regardless of their duty location, and include courses and services provided by accredited postsecondary vocational and technical schools, colleges, and universities. Programs may be provided as traditional classroom instruction or through distance education. (DoDD 1322.8E, 2005, p. 2)

The Navy's TA program is a subprogram of the DoD VOLED program. It is an extremely generous program compared to those offered by private sector firms, providing funds to assist both officer and enlisted personnel with tuition costs, enabling these sailors to enroll in courses supporting completion of a high school diploma, or an associate's, bachelor's, master's, or doctoral degree. TA covers 100% of tuition, with a maximum cost of $250 per semester hour. It will provide for up to 16 semester hours or 24 quarter hours per fiscal year (OPNAVINST 1560.9A, 2008). This thesis will concentrate on enlisted sailors pursuing undergraduate education using the Navy's TA program.

C. PRIOR RESEARCH ON THE NAVY'S TUITION ASSISTANCE (TA) PROGRAM

Research has already been conducted on the retention and promotion effects of the Navy TA program. The first study to address this area was Garcia and Joy (1998), which was conducted for the Center for Naval Analyses (CNA). This study attempted to determine the impact of the VOLED program on promotions and careers, as well as the cost-effectiveness of the program. It also offered recommendations for improving the VOLED program.

The primary means of measuring the effect of the VOLED program used in this study were the promotion and demotion of participants versus nonparticipants. Garcia and Joy found that VOLED had a significant positive relationship with both promotion to E-5 and retention past the first enlistment term. It also found that, although cost-effective, TA is less cost-effective than academic skills education. In other words, they found that the lower the level of education, the higher the rate of return (Garcia & Joy, 1998).

Although groundbreaking in investigating the returns to the Navy TA program, the study contained some flaws. First, it analyzed all facets of the VOLED program, to include the TA program, the Program for Afloat College Education (PACE), Academic Skills Learning Centers, and Education Centers. Each facet of the VOLED program is geared to provide a different service to its customers. It is likely that sailors who self-select the TA program have different ability and motivation levels than sailors utilizing the PACE program or the Skills Learning Centers. Additionally, only one cohort of sailors was followed for five years, from 1992 to 1997. This may not take into account differences that exist among different cohorts of sailors.

Garcia, Arkes, and Trost conducted a second study into the Navy's VOLED program in 2002. This study also found positive returns on investment in general education by large firms—as high as 13 percentage points. This study implemented an instrumental variable (IV) to control for selection bias due to self-selection into the program. They theorized that a sailor's attendance at an academic counseling session was, to a large extent, associated with external events and was, therefore, a random event (Garcia, Arkes, and Trost, 2002).

In 2005, Richard Buddin and Kanika Kapur of the RAND Corporation conducted a third study of the Navy's TA program. They argued that the results obtained by the previous two studies were ambiguous and problematic. The IV used to correct for selection bias, attending a counseling session, is at best a weak IV. It stands to reason that sailors who choose to attend a counseling session are more interested in the TA program than those who do not and, therefore, endogenous (Buddin & Kapur, 2005).

Buddin and Kapur hypothesized that access to college before enlistment would strengthen interest in college over those members that lived further away. They also hypothesized that the more educational opportunities available on base, the more likely a member was to utilize the TA program. Lastly, they created an interaction between base size and the number of educational opportunities to proxy for a peer effect. All three IVs were dependent on the fact that a member does not control where they grow up and what base they are assigned to during their first enlistment (Buddin & Kapur, 2005).

Contrary to the previous studies, and in keeping with the accepted human capital theory, Buddin and Kapur found that sailors utilizing TA are 16.5 percentage points less likely to remain in the Navy than their counterparts. Much of this difference can be traced to a restriction placed on the data. Buddin and Kapur restricted their sample to include only those sailors who made it to the 4-year mark in service, because they believed that TA usage will likely have the largest effect on worker mobility for first-term members; therefore, they needed to have made it far enough in service to have the option of staying for a second term. Those sailors who did not reach the 4-year mark in service did not have the same amount of time to make use of TA and, therefore, were fundamentally different than sailors who reached the end of their first enlistment (Buddin & Kapur, 2005).

More recent research by Mehay and Pema (2009) takes a different approach to identifying the effect of TA on reenlistment and promotion. Unlike the previous studies, Mehay and Pema take a multi-cohort approach to account for differences in reenlistment among first-term sailors. Another innovation in their study is that they use a "natural" control group of sailors who enroll in TA classes, but due to external events, are unable to complete their classes. They believe that this reveals the individual's otherwise unobserved motivation and initiative, and serves as a proxy for how TA participants would have performed in the absence of additional education (Mehay & Pema, 2009).

Mehay and Pema found that TA users are more likely to stay in the military and be promoted during their first term of service, consistent with Garcia et al. (2002), and the hypothesis that general education increases individual productivity more within the

organization than the external labor market. They also found that the educational assistance program has a stronger retention effect on women and minorities (Mehay & Pema, 2009).

D. NAVY COLLEGE DISTANCE LEARNING PARTNERSHIPS (NCPDLP)

In 1999, the Navy introduced a pilot program of partnerships with five DL programs. These programs offered degrees that were directly related to a sailor's rating or job field. This original pilot program was the genesis for what was to become the NCPDLP.

In 2004, the program was revamped to include more degrees to cover all of the Navy's ratings. This program focused on allowing a sailor to complete a career-enhancing degree in the sailor's career field. At the close of the open enrollment period in 2004, the Navy had partnered with 17 academic institutions offering approximately 96 degree programs. Each of the 96 degree programs was linked to one or more of the Navy enlisted ratings (R.C. Smith, personal interview, October 19, 2009).

The NCPDLP program was once again overhauled in August 2007, to offer sailors more choice. Enrolling in a course of study that directly relates to a sailor's career field is no longer required. As of February 2010, the Navy is currently partnered with 34 fully accredited academic institutions that offer 264 degree programs at the associate and baccalaureate level. A complete listing of schools can be found in Table 1. All schools must sign a Memorandum of Understanding (MOU) with the Navy that covers various aspects of the program (R.C. Smith, personal interview, October 19, 2009).

There are significant advantages for the sailor to enroll in the NCPDLP program. Part of the MOU with the academic institution caps the tuition and course fees for each class to the TA rate ($250/hr). College courses taken through other means (DL or otherwise) can cost significantly more than the TA rate, causing the sailor to incur the difference as an out-of-pocket expense. In addition, Servicemember's Opportunity Colleges (SOC) reviews all NCPDLP academic institutions and degree programs to ensure academic integrity and transferability of credits (R.C. Smith, personal interview, October 19, 2009).

Table 1. NCPDLP List of Participating Institutions (After: Navy College Center, 2009)

Navy College Program Distance Learning Partnership Schools	
American Military University	Olympic College
Berkeley College	Regent University
Bismarck State College	Roger Williams University
Central Texas College	Saint Joseph's College of Maine
Charter Oak State College	Saint Leo University
City University of Seattle	San Diego City College
Coastline Community College	Southern New Hampshire University
Columbia College	Strayer University
Dallas TeleCollege	Thomas Edison State College
ECPI College of Technology	Trident Technical College
Embry-Riddle Aeronautical University	TUI University
Empire State College	University Of Maryland University College
Excelsior College	University of Oklahoma
Florida National College	University of the Incarnate Word
Florida State College At Jacksonville	Upper Iowa University
Fort Hays State University	Vincennes University
Hawaii Pacific University	
Old Dominion University	

E. STUDENT SATISFACTION WITH DISTANCE LEARNING (DL)

Student satisfaction has been shown to play a large role in the performance and commitment of students enrolled in college classes. Several studies have been conducted to determine how student satisfaction affects success in DL college classes. Salisbury, Pearson, Miller and Marett (2002) conducted research strictly into the view of students, through both questionnaires and perceptions recorded, while enrolled in an MBA Information Systems course. A form of synchronous DL, the control group attended the class locally, while the experimental group took class at a remote site more than 100 miles away.

The strongest findings in the study indicated that DL students experienced reduced feelings of belonging to the class, lower degrees of satisfaction with the class, less favorable evaluations of the class, and they perceived that they had participated less in the class than students enrolled at the local site. The study did not investigate whether

students enrolled in the distance class fared better or worse than their counterparts in terms of course success (Salisbury et al., 2002).

Borstoff and Lowe (2007) also conducted research on student perceptions and opinions toward DL. They researched similar areas to Salisbury et al. (2002) and explored experience, reasons for enrolling in DL, student-to-instructor interaction, effort applied to coursework, and communication with instructor and fellow students. The results of their research ran contrary to Salisbury et al. (2002), finding that 88% of students were satisfied with their DL course, 88% would take another DL course, and 77% would recommend DL to their colleagues (Borstoff & Lowe, 2007).

Although both studies show different results for student satisfaction with DL, this can most likely be attributed to the rise in availability and usage of DL, and changes in attitude over time. What is constant between the two studies is that the perception of communication levels, reasons for enrolling in DL, and effort applied to schoolwork is highly dependent on the individual. Neither study researched the effect of taking a DL class on student success. This will be discussed in Section F.

F. EFFECTS OF DISTANCE LEARNING (DL) ON STUDENT PERFORMANCE

The previous studies of the effect of TA focused mainly on the overall effect of TA on retention and promotion, but not the differences that exist by method of instruction. Encyclopedia Britannica describes DL classes as:

> A form of education in which the main elements include physical separation of teachers and students during instruction and the use of various technologies to facilitate student-teacher and student-student communication. Distance learning often focuses on non-traditional students, such as full-time workers, military personnel, and nonresidents or individuals in remote regions who are unable to attend classroom lectures. (Encyclopedia Britannica, 2010)

Several studies have focused on the effects of DL versus traditional course delivery in undergraduate instruction. These studies, although not directed at the military, are applicable to sailors who would select DL versus traditional courses. One of the first such studies was conducted at Cuesta Community College in 1999. Ryan

Cartnal and David Diaz (1999) wanted to study different learning style preferences of students. They believed that if optimal student learning is dependent on learning style, faculty should alter their preparation and instruction methods accordingly. The purpose of their study was to compare learning styles of online health education classes with equivalent on-campus classes (Cartnal & Diaz, 1999).

Diaz and Cartnal found that students enrolled in DL classes were significantly more independent learners than students in the equivalent on-campus class. They also found that students in DL classes were significantly more intrinsically motivated and less interested in collaboration with classmates. Students who possessed a more independent and conceptual learning style received the highest average score in the student achievement areas. Students who had the lowest scores in student achievement in DL courses demonstrated a more social and conceptual learning style. Students with both a social and applied learning style fared much better in the on-campus class (Cartnal & Diaz, 1999).

MacLaughlin, Supernaw, and Howard (2004) compared students who videoconferenced from a remote site against students who were in the classroom face-to-face with the professor. Videoconference DL is considered synchronous DL because students are participating in the class in real-time, separated only by space. Students who videoconference in watch the lecture live and have the ability to interact with the professor, but do not experience face-to-face contact with other students, and may not develop the socialization and interpersonal skills that usually accompany traditional learning methods. This led the authors to question whether students who attend class via videoconference are as successful as those who attend locally.

MacLaughlin, Supernaw, and Howard (2004) compared GPAs of students at distant sites against those enrolled locally prior to class to ensure that there was not a significant difference between the students. They then compared course grades of the students enrolled locally against those enrolled at distant sites across four classes to determine if DL students fared better or worse than their locally enrolled peers. The

authors determined that there was no significant difference in course grades between students who attended classes locally and those who used videoconferencing to attend class.

A study conducted in 2005 by Stephenson, McGuirk, Zeh, and Watts Reaves concentrated on asynchronous DL classes and how students enrolled in these classes fared against students enrolled in on-campus economics classes at Virginia Tech University. Asynchronous DL classes do not have a set time or place to conduct schoolwork; they are truly designed for students to work at their own pace. Asynchronous DL tends to appeal to students who work full time and can arrange to complete schoolwork around their busy schedule.

Stephenson et al. (2005) used several metrics to compare DL to traditional economics classes. They conducted surveys on student satisfaction, interest and attitude toward their courses, they monitored test performance, and they compared the demographic characteristics (GPA, Scholastic Aptitude Test (SAT) scores, race, gender, etc.) of the two groups of students. In every category, traditional classroom instruction produced significantly higher educational outcomes. They found that for students with SAT scores below 1,000, the difference in learning between distance and classroom might be as large as two full letter grades. Their results indicate that all but the most gifted DL students are not learning as much as traditional classroom students (Stephenson et al., 2005).

Finally, Kan, and Cheung (2007) conducted research on the relative effects of DL versus traditional course delivery in Hong Kong. As with the Stephenson et al. (2005) study, the research focused on asynchronous DL instruction. This study differed from Stephenson et al. in its approach and student composition. The study was conducted at the Open University of Hong Kong (OUHK) and was conducted on students who enrolled in DL classes. DL classes at OUHK are open to anyone that wishes to enroll and, as such, provide a diverse set of demographics. The results from these classes were compared against students who enrolled in traditional classroom classes and had to apply to receive admission—providing a more homogeneous background.

The content of the two classes (DL and traditional) was essentially the same. Students enrolled in DL classes received a self-instructional study package and eight optional 2-hour, face-to-face tutorials. Part-time tutors, who had tutored the classes for at least three years, conducted these tutorials. A full-time lecturer taught the traditional classroom courses.

Kan and Cheung (2007) gathered background data that included each student's age, gender, marital status, semester course loads, academic qualifications, English proficiency level, and course results from university records. They then created a course score comprised of both class work and a final examination to measure the academic performance of the students. The background data was then combined with the course scores to compare the outcomes of the DL students versus traditional students.

After comparing the course score for the two groups, the students who completed classroom training fared considerably better. They authors further broke down the results into categories to control for age, gender, marital status, academic background, semester course load, and previous academic achievement. In every case, the students enrolled in classroom training outperformed those in DL. The results strongly suggest that face-to-face contact plays a very important role in student learning (Kan & Cheung, 2007).

The studies mentioned above demonstrate that students enrolled in traditional classes do better than those enrolled in DL classes, which are typically more easily accessible to full-time workers who would otherwise not be able to take classes. The admission requirements are typically lower (in some cases, nonexistent) and the resources available for assistance are much less. Although students do not necessarily perform as well as they would in traditional face-to-face training, DL does open up the ability to take classes to those who otherwise would not be able to attend full, or even part-time, programs.

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III. ANALYSIS OF TUITION ASSISTANCE (TA) COURSE-LEVEL DATA

A. INTRODUCTION

This chapter examines the factors that predict the successful completion of undergraduate courses by enlisted personnel. In particular, the chapter analyzes the effect of DL on successful course completion as well as on GPA.

B. DESCRIPTION OF COURSE-LEVEL DATASET

The NETC supplied data on all classes taken through TA from 1995 through 2007. The Navy Campus Management Information System (NCMIS) compiled 1,837,279 course-level observations for all active duty personnel. This study restricts the data to enlisted personnel in pay grades E1 through E9 who enrolled in undergraduate college-level classes. These restrictions reduced the data set to 1,336,878 observations. The data was further restricted to ensure that observations missing key pieces of data were not included in statistical analysis. For this reason, all observations missing gender, race, or TA type (DL versus traditional) were removed from the data set. The final dataset consists of 1,296,223 observations.

Table 2 provides descriptive statistics for enlisted sailors who used TA for undergraduate college classes from 1995 through 2007. This table displays the percent distribution by demographic characteristics to show which groups tend to utilize TA the most. It further separates TA by type of class in columns 2 and 3, indicating the preferences for type of TA by demographic group.

Table 2. Percent Distribution of TA Participants by Demographic Characteristics, 1995–2007

Variable	All TA Participants	DL Participants	Traditional Participants
Female	24.19%	25.58%	23.77%
White	38.39%	52.08%	34.30%
Black	31.23%	24.01%	33.40%
Hispanic	12.11%	12.43%	12.02%
Native American	5.41%	3.55%	5.97%
Pacific Islander	4.29%	3.84%	4.43%
Asian	1.95%	1.98%	1.95%
Unknown	6.35%	1.76%	7.72%
Other	0.25%	0.35%	0.22%
E1 - E3	11.84%	8.03%	12.98%
E4	18.33%	14.85%	19.36%
E5	30.48%	30.30%	30.54%
E6	23.27%	26.67%	22.26%
E7	11.80%	14.55%	10.97%
E8	3.28%	4.25%	2.99%
E9	1.00%	1.35%	0.90%
AFQT Percentile	62.22	63.26	61.88
Observations	1,296,287	298,598	997,689

Conforming to expectations, TA usage tends to be highest for pay grades E5 and E6. Junior sailors in pay grades E1 through E3 do not have the same opportunity to use TA as more senior personnel. They typically report to Boot Camp and, upon graduation, are then sent to either an A-school or directly to the "Fleet" in a sea duty status. Either case does not allow sailors much time to utilize TA due to the heavy workloads that accompany A-school or sea duty billets. Upon reaching the pay grade of E4, sailors tend to have a better grasp of their role in the Navy and may be transitioning to shore duty. Although still full-time employment, shore duty allows more time to complete TA courses off-duty.

TA usage tends to be lower in the pay grades of E7 through E9 than that of sailors in pay grades E4 through E6. Sailors at this level are generally winding down their careers in the Navy and are preparing to transition into the civilian workforce. Expectations would be that sailors would be taking advantage of TA to help prepare for this transition. One explanation for the lower usage might be that these senior sailors already have taken advantage of TA when they were at lower pay grades to obtain an associates or baccalaureate degree and do not need to take further TA classes.

Gender participation is also worth noting in this table. Females make up 24.19% of all TA participants from 1995 through 2007, yet made up fewer than 17% of the total force over the same period. This may be attributed to the Navy's policy prohibiting women from participating in combat specialties such as subsurface forces, Special Operations Forces, or other combat intensive occupations. Women are, therefore, typically assigned to ratings that do not deploy as often and which may offer better opportunities to take TA classes.

The decision to participate in DL classes versus traditional classes reverses as sailors move through the ranks. Pay grades E1 through E5 participate in DL at lower rates than overall TA participation for the same pay grades. In the senior pay grades of E6 through E9 this trend reverses, and these sailors tend to participate in DL at higher rates than overall TA participation. This is most likely due to the age and demands placed on more senior sailors. DL classes are more adaptive to restrictive work schedules and family demands, and senior sailors have the maturity to handle classes with less guidance than is provided in the traditional classroom setting.

To better understand the comparison of DL to traditional classroom instruction it is important to examine the course distribution by both subject and pay grade. Table 3 breaks down the course subjects into 12 broad categories. It gives the percentage of sailors enrolled in each subject by instruction method and pay grade. The largest difference by course type takes place with vocational classes; service members are more than three times as likely to enroll in vocational classes via traditional methods rather than DL. The hands-on nature of vocational classes does not lend them to delivery by DL. Information technology classes are taken at a higher rate via DL than traditional methods, possibly due to the higher level of technological savvy necessary to participate in DL classes.

Table 3. Percent Distribution of Course Instruction Method and Pay Grade of Student by Course Subject

	Instruction Method		Pay Grade						
Variable	Traditional Course	DL Course	E1-E3	E4	E5	E6	E7	E8	E9
Business	13.84%	16.70%	8.72%	10.64%	14.17%	16.86%	19.89%	21.52%	22.31%
History	5.77%	6.23%	7.38%	6.44%	5.62%	5.48%	5.21%	4.97%	5.78%
Math	8.98%	5.92%	9.40%	8.79%	8.43%	7.67%	7.34%	7.67%	7.55%
Natural Sciences	7.82%	7.65%	8.70%	8.72%	7.82%	7.26%	6.78%	6.59%	6.21%
Physical Science	2.92%	1.58%	1.99%	2.75%	2.91%	2.76%	2.24%	2.02%	1.66%
Information Technology	11.94%	15.36%	10.65%	11.39%	12.93%	14.07%	13.64%	13.16%	12.59%
Humanities	20.57%	21.89%	25.10%	23.03%	20.61%	19.14%	18.44%	17.93%	18.29%
English	12.08%	11.80%	15.50%	13.59%	12.09%	10.72%	9.61%	8.91%	8.54%
Miscellaneous	2.57%	2.80%	1.93%	2.46%	2.66%	2.86%	2.78%	3.36%	3.31%
Medical	3.61%	3.77%	3.75%	4.68%	3.61%	3.08%	3.32%	3.21%	2.78%
Vocational	5.75%	1.59%	2.62%	3.26%	4.46%	6.08%	6.88%	6.75%	7.38%
Law or Criminal Justice	4.14%	4.71%	4.26%	4.25%	4.69%	4.02%	3.87%	3.92%	3.58%
Observations	997,689	298,598	153,469	237,550	395,127	301,702	152,911	42,549	12,979

Seniority also plays a role in the subjects that are taken and course success. E7 and higher-level sailors are more than twice as likely to enroll in business classes as their junior counterparts. This is most likely due to more senior personnel preparing for retirement and joining the civilian workforce. Junior personnel, on the other hand, are much more likely to enroll in English or humanities classes than senior enlisted personnel. Table 4 provides indicators of course success by pay grade including passing rate, GPA, DL GPA, and traditional GPA. Pay grade clearly plays a large role in both successfully completing a class and GPA. This is most likely attributed to the maturity that comes from age and with additional responsibilities assumed with promotion. It may also act as a proxy for ability, as more able recruits are more likely to promote.

Table 4. Course Success Indicators by Pay Grade

Variable	E1-E3	E4	E5	E6	E7	E8	E9
Successfully Passed Course	79.17%	84.40%	88.12%	90.47%	93.07%	93.85%	93.79%
GPA	2.78	3.02	3.17	3.29	3.42	3.51	3.56
DL GPA	2.67	2.88	2.97	3.09	3.26	3.39	3.43
Traditional GPA	2.80	3.06	3.23	3.35	3.49	3.56	3.62
Observations	153,469	237,550	395,127	301,702	152,911	42,549	12,979

The previous observations were made using simple tabulations and summary statistics and may not reflect systematic relationships. The next section utilizes multivariate statistical methods to analyze the data in a systematic manner to estimate the effects of course type, course subject, and demographics on course success and GPA.

C. MULTIVARIATE MODELS

This section discusses the specification of the multivariate models used to estimate the impact of method of instruction on course completion and course GPA. This section defines the explanatory variables, explains the estimation methodology used to obtain unbiased program effects, and explains their respective effects on course completion and GPA.

As supported by the literature review and descriptive statistics of the data set, DL users are significantly different from those who enroll in traditional-style classes. Fixed effects estimation can account for much of this unobserved heterogeneity in the data set.

Fixed effects estimation holds everything constant about the individual that does not change over time, including intrinsic qualities such as motivation, discipline, and ability, allowing for the removal of the bias present from nonrandom selection into each course delivery method. Both the course completion and GPA models are estimated using fixed effects model specification.

The course completion and GPA model is estimated using the following model:

$$\boldsymbol{Y_{it} = \alpha + \beta_1 DL_{it} + \beta_2 Subject_{it} + \beta_3 DL_{it} Subject_{it} + \beta_4 Paygrade_{it} + \beta_5 DL_{it} Paygrade_{it} + \beta_6 FY_t + a_i + u_{it}} \quad (1)$$

where Y_{it} represents the dependent variable of course completion or course GPA, subject, the interaction of subject and DL, pay grade, and the interaction of pay grade and DL. FY_t denotes the fiscal year the course was taken and is included to control for yearly effects, and a_i represents the individual fixed effects, such as motivation and ability, that we want to separate from the effects of DL. U_{it} represents the error that we cannot account for with the other variables. Demographic variables, such as gender, race, Armed Forces Qualification Test (AFQT) and entry education level, are not included in this estimation because they do not vary over time and are, therefore, netted out in the fixed effects estimations.

Table 5 provides the definition of the course completion and GPA variables. Successful course completion is a binary variable and takes on a value of 1 when a student receives a grade of A, B, C, D, Pass, or Satisfactory. All other values are assigned a value of 0. This definition does not take into account whether or not a sailor is on sea or shore duty or personal or professional hardships that would cause a sailor to prematurely withdraw from a course.

GPA is used as a dependent variable to compare only those who received a grade for their course. Students who receive a grade of incomplete are included with students who receive an F because they did not withdraw from the course. Non-graded classes are also dropped because the difficulty and necessary requirements to pass are ambiguous. This helps control for students who must withdraw due to professional or personal hardships.

Table 5. Dependent Variable Specification

Grade Received	Course Completion	GPA
A	1	4
B	1	3
C	1	2
D	1	1
F	0	0
Incomplete	0	0
No Grade Assigned	0	dropped
Pass	1	dropped
Satisfactory	1	dropped
Withdrawl	0	dropped

D. RESULTS OF MULTIVARIATE MODELS

Table 6 provides the results of the fixed effects multivariate analysis conducted on both course completion and GPA. The entire regression results can be found in Appendix A. These results are similar to the results obtained by Kan and Cheung (2007) and Stephenson et al. (2005). Students who enroll in DL classes are 10.7 percentage points less likely to successfully complete a course than their counterparts who enrolled in traditional-style TA classes. The results also clearly indicate a positive effect of pay grade on course success, which becomes larger for higher pay grades.

As mentioned in the model specification section, the course completion model is limited in its ability to address those students who were forced to withdraw or drop classes due to work demands or personal issues. The GPA model is better equipped to deal with these exogenous issues by dropping sailors who withdraw or drop the course. In this case, the results show that a student enrolled in a DL class generally receives a grade that is 0.42, or almost half a letter grade, lower than a student who enrolls in a traditional class. This result agrees with Stephenson et al. (2005), who estimated the negative effects of DL to be as high as two letter grades for students with SAT scores below 1,000.

Table 6. Multivariate Model Results

	Dependent Variable	
Explanatory Variable	**Course Success**	**Grade Point Average**
DL Course	-0.107	-0.42
	(0.009)***	(0.027)***
Paygrade of E4	0.013	0.094
	(0.002)***	(0.007)***
Paygrade of E5	0.03	0.167
	(0.003)***	(0.009)***
Paygrade of E6	0.043	0.171
	(0.004)***	(0.012)***
Paygrade of E7	0.066	0.156
	(0.005)***	(0.016)***
Paygrade of E8	0.076	0.143
	(0.007)***	(0.021)***
Paygrade of E9	0.095	0.118
	(0.010)***	(0.032)***
Observations	1,296,287	1,165,325
Number of Individuals	216,346	200,502
* significant at 10%; ** significant at 5%; *** significant at 1%		

The results also help to explain the snapshot presented by the summary statistics in Section B of this chapter. The increasing estimated positive effect of pay grade in both the course completion and GPA models mirrors the increasing course completion level and GPA tabulations presented in Table 4.

IV. PROMOTION MODELS

A. INTRODUCTION

This chapter will discuss the estimated effect of TA use on the promotion of sailors during their first enlistment, followed by the estimated effect of TA on promotion during their second enlistment term. First, the origins of the data used in the promotion regression models will be discussed. Next, descriptive statistics will be provided to give an overview of the analysis samples. Finally, the multivariate model specification will be discussed and results presented.

B. CONSTRUCTION OF FIRST- AND SECOND-TERM DATASETS

DMDC provided the Navy enlisted master file by quarter from the third quarter of 1994 through the fourth quarter of 2007. This database provides demographic data such as age, race, gender, and education status at entry. Proxies for work demands on the sailor are based on pay grade, military occupation (rating), and the Unit Identification Code (UIC). Demands on the sailor from external sources are also provided by marital status and number of dependents. The AFQT score provides a proxy for the sailor's innate ability.

The NETC supplied data on all classes taken through TA from 1995 through 2007. The NCMIS compiled 1,837,279 course-level observations for all active duty personnel. The data was further restricted to ensure that observations missing key pieces of data were not included in statistical analysis. For this reason, all observations missing gender, race, or TA type (DL versus traditional) were removed from the data set. This database was then collapsed by individual and fiscal year to give one observation per person, per fiscal year. This allowed the NCMIS data to merge successfully with the DMDC data in a panel format.

1. First Enlistment Term Database

Once the individual quarterly files are merged together, it provides a longitudinal snapshot of changes over time for the individual sailor. The merged database contains

941,340 observations, representing sailors who served in the Navy between the third quarter of 1994 and the fourth quarter of 2007. In order to create the first enlistment term panel cohort data, all personnel who entered the Navy before January 1, 1994 were dropped from the data set. Next, all sailors who enlisted after December 31, 2004 were dropped from the dataset due to their inability to complete four full years of service by December 31, 2007. All personnel who did not sign 4-year contracts were dropped from the dataset to provide a comparison of enlistees with equal contracts. Lastly, all personnel who did not stay in the Navy long enough to have the opportunity to reenlist (36 months) were dropped from the data set, leaving a database of 217,408 individuals.

Finally, observations with incomplete demographic data also were removed. In particular, sailors with incomplete gender, race, entry-level education, AFQT, or reenlistment information were removed from the data set, leaving 200,211 individuals (approximately 8% of the population was removed due to incomplete data). The data were then transformed into panel data to provide one observation per year of enlisted service (1 through 4), per individual. This left a dataset comprised of 800,844 person-year observations for 200,211 individuals. Finally, the NCMIS database was then merged into the DMDC database by personal identifier, to provide data for sailors who enrolled in the TA program to compare to the sailors who did not enroll in the TA program.

2. Second Enlistment Term Database

The database of sailors entering their second enlistment term was constructed in much the same way as the first enlistment term database. The starting point for the second enlistment term sample was the database containing 941,340 observations between the third quarter of 1994 and the fourth quarter of 2007. All personnel who entered the Navy prior to January 1, 1990 were dropped from the sample so that sailors would enter their second term starting in 1994. Next, all sailors who enlisted after December 31, 2000 were removed from the dataset due to their inability to complete

eight full years of service by December 31, 2007, leaving a sample consisting of 104,970 observations. Due to the varying lengths of the second term, the second-term dataset was not restricted to 4-year enlistments.

After removing all personnel who enlisted after December 31, 2000, observations containing incomplete demographic data also were dropped from the dataset to provide accurate comparisons to other second-term and first-term sailors. Sailors with incomplete information on gender, race, entry-level education, AFQT, or reenlistment were removed from the dataset, leaving 73,927 observations (approximately 30% of the population was removed due to incomplete data). The percentage of observations removed due to missing or incomplete data was much higher in the second term (30% versus 8%), due to the age of the data and lack of complete records available. The data were transformed into panel data to provide one observation per year of enlisted service (labeled 1 through 4), per individual. This left a sample consisting of 295,708 observations for 73,927 individuals. Finally, the NCMIS database was merged into the DMDC database by personal identifier, to provide data for sailors who enrolled in the TA program to compare to the sailors who did not enroll in the TA program.

C. DESCRIPTIVE STATISTICS FOR FIRST- AND SECOND-TERM SAMPLES

Table 7 provides descriptive statistics for the samples of first- and second-term sailors in the Navy. As expected, the percentage of married sailors increases from the beginning of the first term to the end of the second term. There is a slight drop in percentage of married sailors from the fourth year of the first term to the first year of the second term, which is most likely due to missing information in the data provided. The number of high school graduates holds relatively constant at 87%, but the number of non-high school graduates drops from 5.41% to 4.83%, and the number of sailors with General Equivalency Diplomas (GED) drops from 2.85% to 2.46%. This suggests that non-high school graduates do not retain in the Navy as well as high school graduates, which is consistent with prior research. The vast majority of sailors are eligible and selected to E4 within the first enlistment term, with less than 4% of the sample eligible for promotion to E4 in any year in the second enlistment term. Promotion to E5 is much

more competitive during the first term, and may be a better predictor of the impact of TA on promotion due to the selection process and time-in-rate requirements. A little over 47% of the sample is eligible for promotion after the third year of their first-term enlistment, but only 4.5% are promoted to E5. In the last year of the first enlistment, approximately 70% of the sample is eligible for promotion, but only 14% of the sample is selected for promotion.

Table 7. First- and Second-term Demographics

	Year of First-term Enlistment				Year of Second-term Enlistment			
	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
Married	19.00%	26.55%	32.05%	37.14%	30.72%	38.14%	45.11%	52.33%
Dependents	10.39%	17.79%	24.82%	31.87%	47.29%	55.54%	62.50%	68.19%
Female	16.29%	-	-	-	11.70%	-	-	-
No High School Diploma	5.41%	-	-	-	4.83%	-	-	-
GED	2.85%	-	-	-	2.46%	-	-	-
High School Diploma Graduate	87.71%	-	-	-	87.92%	-	-	-
Some College	1.93%	-	-	-	1.68%	-	-	-
Associate's Degree	2.09%	-	-	-	1.24%	-	-	-
College Degree	0.00%	-	-	-	1.87%	-	-	-
Eligible for Promotion to E4	21.36%	56.37%	73.81%	46.23%	3.65%	3.70%	0.89%	0.20%
Promoted to E4	2.73%	16.33%	33.93%	29.73%	96.22%	2.87%	0.69%	0.14%
Eligible for Promotion to E5	2.35%	17.19%	47.36%	69.79%	92.30%	49.00%	29.70%	16.90%
Promoted to E5	0.03%	0.07%	4.50%	14.18%	48.47%	20.12%	12.98%	8.35%
Eligible for Promotion to E6	N/A	N/A	N/A	N/A	30.61%	46.12%	44.52%	44.53%
Promoted to E6	N/A	N/A	N/A	N/A	0.61%	2.91%	6.51%	10.11%
Eligible for Promotion to E7	N/A	N/A	N/A	N/A	0.49%	2.30%	2.31%	2.33%
Promoted to E7	N/A	N/A	N/A	N/A	0.00%	0.00%	0.02%	0.13%
White	57.85%	-	-	-	55.84%	-	-	-
Black	17.70%	-	-	-	22.21%	-	-	-
Hispanic	12.40%	-	-	-	11.95%	-	-	-
Asian	5.41%	-	-	-	7.36%	-	-	-
Native American	2.82%	-	-	-	1.92%	-	-	-
Other	0.48%	-	-	-	0.64%	-	-	-
Unknown	3.34%	-	-	-	0.07%	-	-	-
AFQT Percentile	60.99	-	-	-	61.06	-	-	-
Average Age	20.18	21.18	22.18	23.18	24.69	25.69	26.69	27.69
Average Paygrade	1.82	2.82	3.54	3.99	4.45	4.71	4.91	5.09
Observations	200,211	200,211	200,211	200,211	73,927	73,927	73,927	73,927
- denotes that demographic does not change across enlistment								
N/A denotes that category is Not Applicable								

In the second term, most sailors are eligible for promotion to E5 by the second year, but less than 30% are eligible for promotion after this point. In the second term, promotion to E6 may be a superior indicator of the impact of TA on promotion due to the highly selective nature of this rank. Less than 50% of the sample is eligible for E6 in any given year, with no more than 11% of the eligible personnel being selected for E6 in any given year. Promotion to E7 is ultra-competitive, with less than 0.15% of the entire sample promoting in the second enlistment term. Due to the extremely small representation of E7 selectees, this outcome is not analyzed.

Table 8 provides descriptive statistics on Tuition Assistance enrollments for first- and second-term sailors. TA usage is limited during a sailor's first two years in the Navy. Less than 4% of the entire sample uses TA in either of the first two years, with less than 0.5% of the sample using DL in the first two years. This is expected, due to the rigorous nature of a sailor's first two years, which includes Boot Camp, A-school, and possibly C-School. The nature of the training in these schools does not allow much time for students to enroll in TA classes. After the first two years of service, the percentage of the sample enrolled in TA steadily increases. By the fourth year of the second term, almost 20% of the sample is enrolled in either a DL or traditional class. This information supports the descriptive statistics shown in Table 2 of Chapter III, which shows that sailors in the E5 and E6 pay grades take the majority of TA classes.

Of the sailors enrolled in TA, the number of classes taken per year increases from less than two classes per year at the beginning of the first-term of service, to approximately three classes per year at the end of the second term. The average number of DL classes taken per year also increases from 0.02 in the first year of the first term, to 0.78 by the end of the second term. The number of traditional classes taken per year rises during the first term and falls during the second term. This demonstrates that as sailors become more senior and more comfortable in their Navy job, they are more willing to enroll in TA classes. Also, as sailors become more senior in the Navy and incur more responsibility at work and at home, DL classes become more attractive because of their flexible nature.

Table 8. Tuition Assistance Descriptive Statistics for First- and Second-term Sailors

		Year of First Term Enlistment				Year of Second Term Enlistment			
		Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
Entire Database	Percentage enrolled in DL Classes	0.00%	0.34%	1.00%	1.80%	1.20%	2.60%	4.70%	6.61%
	Percentage enrolled in traditional classes	0.23%	3.82%	6.22%	6.54%	6.50%	9.51%	12.58%	12.80%
	Percentage to only enroll in DL classes	0.00%	0.25%	0.72%	1.27%	0.80%	1.76%	3.22%	4.88%
	Percentage to only enroll in tradtional classes	0.23%	3.72%	5.94%	6.02%	6.10%	8.67%	11.10%	11.06%
	Percentage to enroll in both DL and traditional	0.00%	0.10%	0.28%	0.53%	0.39%	0.84%	1.48%	1.74%
Tuition Assistance Participants	Average number of courses taken per person (if enrolled in TA)	1.48	2.04	2.43	2.59	2.62	2.81	2.94	2.88
	Average Number of DL courses taken per person (if enrolled in TA)	0.02	0.14	0.28	0.46	0.32	0.47	0.64	0.78
	Average number of traditional courses taken per person(if enrolled in TA)	1.46	1.90	2.16	2.13	2.31	2.33	2.30	2.10
	Percentage to pass at least one DL course (if enrolled in DL)	100.00%	68.71%	72.94%	75.84%	78.67%	82.78%	84.64%	84.98%
	Percentage to pass at least one Traditional course (if enrolled in Traditional)	80.54%	82.43%	84.40%	86.83%	90.19%	91.64%	92.35%	92.47%

D. MULTIVARIATE MODELS

This section discusses the multivariate model specifications used to estimate the effect of TA on promotion in the first and second enlistment term. This section will also investigate whether the effect of TA on promotion differs by method of instruction. Explanatory variables, estimation methodology used to obtain unbiased program effects, and respective effects on promotion in both the first- and second-term will be discussed in depth.

Promotion to the pay grades of E4 and E5 in the first term of enlistment requires a combination of time-in-rate and passing a performance exam. In contrast, promotion to pay grades E1 through E3 is automatic upon reaching time-in-rate requirements, and therefore is not competitive and was not tracked. Because the sailors are tracked longitudinally for four years, it is possible to pinpoint the exact year of enlistment in which the sailor was promoted. Due to the time-in-rate requirements shown in Table 9, it was also possible to pinpoint the years in which a sailor was eligible for promotion to E4 or E5.

Table 9. Time-In-Rate Promotion Requirements
(From: BUPERS Instruction 1430.16F, 2007)

PAY GRADE	E1 to E2	E2 to E3	E3 to E4	E4 to E5	E5 to E6	E6 to E7	E7 to E8	E8 to E9
TIR	9 MOS		6 MOS	12 MOS	36 MOS			

Promotion to the pay grades of E5 and E6 in the second term also requires a combination of time-in-rate requirements and passing a written performance exam. The pay grade of E4 was not examined in the second enlistment term, due to the fact that less than 4% of the sample is eligible for promotion to E4 in any given year of the second enlistment. It is also possible to promote to the pay grade of E7 in the second term, but the percentage of sailors who make it is less than 0.15% of the entire sample.

As with the course completion model, it is possible to use a fixed effects approach to estimate the effect of TA and method of instruction on promotion among first- and second-term sailors. Because those sailors who get promoted in any given year are

different than those who do not, fixed effects estimation can account for much of this unobserved heterogeneity in the data set. As mentioned in Chapter III, fixed effects estimation holds everything constant about the individual that does not change over time, including intrinsic qualities such as motivation, discipline, and ability. This approach takes away the removal bias present from nonrandom selection for promotion to higher pay grades.

The first- and second-term promotion effects of TA are estimated using the following model:

$$\boldsymbol{Y_{it} = \alpha + \beta_1 TA_{it} + \beta_2 Married_{it} + \beta_3 Dependents_{it} + \beta_4 Married_{it} Dependents_{it} + \beta_5 Rating_{it} + a_i + u_{it}} \quad (2)$$

where Y_{it} represents the dependent variable (promotion) as a result of enrolling in TA classes, marriage status in each year of enlistment, whether the subject has dependents in each year of enlistment, and an interaction of the previous two variables. Since sailors can change ratings during an enlistment, 34 rating categories were included to proxy for job type. The individual fixed effects that remain constant across time for each individual, such as motivation and ability, are represented by the term a_i, while u_{it} represents the error that we cannot account for with the other variables. Demographic variables such as gender, race, AFQT, and entry education level are not included in this estimation because they do not vary over time, and are therefore fall out of the fixed effects regressions.

Fixed effects estimation of Equation 2 yields the estimated promotion effect of taking TA at any time during an enlistment term. By restricting the dataset to only those years in which a sailor was eligible for promotion, it is possible to determine the effect of taking TA only during the time a sailor was eligible for promotion. This allows for a dynamic correlation between TA and promotion.

In order to estimate the effects of DL on promotion, it is necessary to restrict the regression model to only those sailors who enrolled in the TA program. Once this restriction is in place, it is possible to compare the promotion effects of DL versus that of

traditional classes. The first- and second-term effects of DL on promotion are estimated using the following model:

$$Y_{it} = \alpha + \beta_1 DL_{it} + \beta_2 Married_{it} + \beta_3 Dependents_{it} + \beta_4 Married_{it} Dependents_{it} + \beta_5 Rating_{it} + a_i + u_{it} \quad (3)$$

where Y_{it} represents the dependent variable (promotion) as a result of enrolling in DL classes. The other explanatory variables are identical to those presented in Equation 2. Again, by restricting the dataset to only those years in which a sailor was eligible for promotion, it is possible to determine the effect of taking a DL class during the time a sailor was eligible for promotion. This allows for a dynamic correlation between DL and promotion.

E. RESULTS

The results of the first-term promotion model are displayed in Table 10, which displays only the key results. The complete regression results are displayed in Appendix B. For each pay grade of E4 and E5 in the first-term promotion results, there are four columns. Each column represents different sample restrictions based on eligibility for promotion. The first column represents the effect of enrolling in TA if the sailor enrolled in TA sometime during the 4-year enlistment. The second column estimates the effect of TA if the sailor enrolled in TA the same year(s) that they were eligible for promotion. The control group for these two columns is sailors who did not enroll in the TA program.

Table 10. First-term Promotion Results

	First-Term Promotion Results							
	Promotion to E4				Promotion to E5			
	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible
Enrolled in TA Class	0.06	0.176	-	-	0.04	0.064	-	-
	(0.003)***	(0.006)***	-	-	(0.002)***	(0.005)***	-	-
Enrolled in only DL Courses	-	-	-0.077	0.242	-	-	0.082	0.177
	-	-	(0.022)***	(0.038)***	-	-	(0.014)***	(0.026)***
Observations	800,844	395,945	37,682	22,874	800,844	273,662	37,682	18,907
Number of Individuals	200,211	172,883	26,746	17,970	200,211	148,821	26,746	15,388

All regressions include demographics, cohort, and occupation

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

The third column is based on a sample of TA users only and represents the effect of enrolling in strictly DL classes sometime during the first enlistment. The fourth column estimates the effect of enrolling in strictly DL classes in the year(s) in which the sailor was eligible for promotion. The control group for columns 3 and 4 is sailors who enrolled in traditional classroom settings. Sailors who did not enroll in the TA program are not included in the sample for columns 3 and 4. The sample restrictions in each column are the same in the second panel of Table 10, which examines promotions to E5.

Table 11 provides the promotion effect of TA by method of instruction for sailors in their second enlistment term. Again, the full regression results can be found in Appendix C. Table 11 can be read in the same way as Table 10, and provides an insight to the effect of TA by method of instruction on promotion as sailors progress in the Navy. The results indicate that TA has the largest effect on promotion from E3 to E4. It also shows that the effect of taking TA is greatest if taken when the sailor is eligible for promotion.

Table 11. Second-term Promotion Results

	Second-Term Promotion Results							
	Promotion to E5				Promotion to E6			
	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible
Enrolled in TA Class	-0.107	0.14	-	-	0.021	0.003	-	-
	(0.003)***	(0.007)***	-	-	(0.002)***	(0.001)***	-	-
Enrolled in only DL Courses	-	-	-0.10	0.23	-	-	0.04	0.003
	-	-	(0.012)***	(0.036)***	-	-	(0.008)***	-0.003
Observations	295,709	295,709	38,477	13,243	295,709	122,560	38,477	17,253
Number of Individuals	73,928	73,928	22,375	9,658	73,928	34,634	22,375	10,308

All regressions include demographics, colon, and occupation
Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

1. The Effect of Enrolling in the TA Program on Promotion

A sailor who enrolls in TA sometime during his/her first enlistment term is 6 percentage points more likely to be promoted to E4, compared to those who never enroll in the TA program. A sailor who enrolls in the TA program in the year(s) in which they are eligible for promotion is 17 percentage points more likely to be promoted to E4, than a sailor who never enrolled in a TA class. These results suggest that there is something

different about sailors who enroll in TA classes, especially those who enroll in classes during the year(s) in which they are eligible for promotion. The difficulty of taking classes during off-duty time demonstrates that sailors who do enroll in TA classes may have higher ability and motivation than those who do not enroll in TA.

These effects are reduced somewhat when looking at promotion to E5 during the first term. As shown in Table 7, only a small percentage of first-term sailors are promoted to E5, and the differences between TA users and non-TA users may not be as great as for promotion to E4. Sailors who enroll in TA classes sometime during their first enlistment term are 4 percentage points more likely to get promoted to E5 and are 6.4 percentage points more likely to get promoted to E5 if they enrolled in a TA class in the year in which they were eligible for promotion.

In the second term, the effect of enrolling in the TA program is smaller and indicates a 2.1 percentage point difference in promotion to E6 if enrolled in TA sometime during the term. There is less than a 1 percentage point difference in promotion to E6 if a sailor is enrolled in the TA program during the year in which they were eligible for promotion. This indicates that as sailors become more senior in the Navy, those who continue to stay become more homogeneous, and that enrolling in the TA program does not necessarily signal a difference in motivation and ability. It may signal that the sailors who did not enroll in the second term, enrolled in TA in the first term or prior to eligibility for promotion.

2. Effect of Method of Instruction on Promotion

The results presented in Table 10 demonstrate that the method of instruction chosen does matter. Sailors who enroll strictly in DL classes sometime during their first enlistment are 7.7 percentage points less likely to be promoted to E4 than those who enroll in traditional classes. This is likely due to the lower course success and GPA rates discussed in Chapter III. Sailors promoting to E4 are very junior and do not always have the necessary maturity to handle DL classes at that time.

However, the time frame in which sailors choose to enroll in DL classes is an important indicator. Those sailors who enroll in DL classes in the year in which they are eligible for promotion are 24.2 percentage points more likely to get promoted than sailors enrolled in traditional classes. This shows that the Navy prizes the skills and maturity demonstrated by sailors enrolling in DL classes. Sailors who enroll in DL classes in the years in which they are eligible for promotion are different than sailors who enroll in traditional classes.

As with the effect of enrolling in the TA program, the effect of the method of instruction declines as sailors become more senior. Sailors who enroll in DL classes are 4 percentage points more likely to be promoted to E6 than those who enroll in traditional classes, and sailors who enroll in DL classes in the year in which they are eligible for promotion are not statistically different from those who enroll in TA classes. This again demonstrates that sailors become more homogeneous as they become more senior. Sailors who choose DL classes appear to do so because DL classes are more convenient to integrate into busy work and home demands. The results do not necessarily indicate that sailors taking DL are significantly different from those who choose traditional classroom methods.

V. RETENTION MODEL

A. INTRODUCTION

Chapter V focuses on estimating models of the probability of reenlistment by sailors in the first enlistment term. The Navy experiences a high turnover rate of first-term sailors. Much of this can be attributed to attrition, defined as sailors who do not successfully meet the obligations of their first-term enlistment. The reenlistment rate is still lower than 50% for sailors who do successfully complete their first enlistment term. This chapter examines the factors that affect the probability of reenlistment and analyzes the effect of both enrolling in the TA program and of successfully completing a TA course. It further analyzes the effect of method of instruction on retention of first-term sailors.

B. DESCRIPTION OF DATA SET

The database for the retention models is made up of the same data as contained in the promotion model database. DMDC provided the Navy enlisted master file by quarter, from the third quarter of 1994 through the fourth quarter of 2007. This database provides demographic data such as age, race, gender, and education at entry. Proxies for work demands on the sailor are provided in terms of pay grade, military occupation (rating), and the unit the member is attached to (UIC). Demands on the sailor from external sources are also represented in terms of marital status and number of dependents. The AFQT score provides a proxy for the sailor's innate ability.

The NETC supplied data on all classes taken through TA from 1995 through 2007. The NCMIS compiled 1,837,279 course-level observations for all active duty personnel. The dataset was further restricted to ensure that observations missing key pieces of data were not included in the statistical analysis. For this reason, all observations missing gender, race, or TA type (DL versus traditional) were removed from the data set. This dataset was then collapsed by individual to provide one observation per person, allowing the NCMIS data to merge successfully with the DMDC data.

Once the individual quarterly master files from DMDC are merged together, the data are in a cross-sectional format. The merged database contains 941,340 observations, representing sailors who served in the Navy between the third quarter of 1994 and the fourth quarter of 2007. In order to create the first enlistment term cross-sectional cohort data, all personnel who entered the Navy before January 1, 1994 were dropped from the data set. Next, all sailors who enlisted after December 31, 2004 were dropped from the dataset, due to their inability to complete four full years of service by December 31, 2007. All personnel who did not sign 4-year contracts were dropped from the dataset to provide a comparison among those with similar contract lengths. Lastly, all personnel who did not stay in the Navy long enough to have the opportunity to reenlist (36 months) were dropped from the data set, leaving a database of 217,408 individuals.

After removing all personnel who did not survive to the 36-month mark of service from the database, observations providing incomplete demographic data were removed to provide accurate comparisons. Sailors who had incomplete gender, race, entry-level education, AFQT, or reenlistment information were removed from the data set, leaving 200,211 observations. The NCMIS database was then merged into the DMDC database by personnel identifier to provide data for sailors who enrolled in the TA program to compare to sailors who did not enroll in the TA program.

C. DESCRIPTIVE STATISTICS

First-term enlistment retention descriptive statistics are provided in Table 12. The first variable of note is (reenlist). (Reenlist) is defined as the sailor having an ISC of 1100 in their record, showing that they officially reenlisted in the Navy prior to their expiration of active obligated service (EAOS). Sailors in the 1994 through 2004 cohorts had an average reenlistment rate of 40%. Sailors who enrolled in the TA program had a much higher reenlistment rate of close to 60%. Sailors who enrolled in DL classes reenlisted at the highest average rate, close to 71%.

Table 12. First-term Retention Descriptive Statistics

Variable	Overall Sample	TA Participants[a]	Traditional Participants[b]	DL Participants[c]
Reenlist[d]	40.80%	59.65%	57.27%	70.50%
Extend[e]	26.97%	25.75%	27.07%	20.69%
Female	16.29%	25.73%	27.52%	26.55%
White	57.85%	54.24%	52.46%	55.96%
Black	17.70%	19.91%	20.87%	19.88%
Hispanic	12.40%	13.85%	14.66%	12.44%
Asian	5.41%	6.89%	7.32%	6.22%
Native American	2.82%	2.67%	2.48%	2.96%
Other	0.48%	0.62%	0.66%	0.55%
Unknown	3.34%	1.83%	1.55%	1.99%
No H.S. Diploma	5.41%	4.55%	4.48%	4.35%
GED	2.85%	2.44%	2.35%	2.43%
H.S. Diploma	87.71%	89.36%	89.46%	89.56%
Some College	1.93%	1.92%	1.98%	1.97%
Associate's Degree	2.09%	1.73%	1.74%	1.69%
Bachelor's Degree	0.00%	0.00%	0.00%	0.00%
Married	37.14%	39.40%	38.34%	41.74%
Dependents	31.87%	33.50%	31.87%	36.81%
Average Age	23.18	23.22	23.22	23.25
AFQT Percentile	60.99	63.10	62.28	64.70
Successful Completers	-	87.88%	89.06%	81.79%
Enrolled in TA	29.99%	-	-	-
Enrolled in Traditional Class	14.24%	47.47%	-	-
Enrolled in DL Class	23.53%	78.46%	-	-
Observations	200,211	60,053	47,119	28,508

[a]Sample was restricted to only sailors that ever enrolled in TA program

[b]Sample was restricted to only sailors that ever enrolled in Traditional program

[c]Sample was restricted to only sailors that ever enrolled in DL program

[d]Reenlist is defined as sailors with Interservice Separation Code (ISC) of 1100 in Record

[e]Extend is defined as staying past end of first enlistment (>50 months), but no ISC code

The next notable variable (extend) is defined as sailors who extended past the end of their EAOS, but did not have an ISC of 1100 in their record. Extensions are done for a variety of reasons. For example, some sailors are waiting for changes to the Selective Reenlistment Bonus (SRB) or are negotiating for orders to a different command. To be an extender, all personnel must have stayed in the Navy longer than 50 months. Of sailors in the 1994 through 2004 cohorts, approximately 27% extended past their EAOS. Sailors who enrolled in TA classes extended at a slightly lower rate than the average, approximately 26%. Sailors who enrolled in DL classes had notably lower extension rates at 20%.

Another interesting trend among the sailors is the difference in average AFQT scores. The entire database averaged an AFQT percentile score of approximately 61%. Sailors enrolled in the TA program had a slightly higher average AFQT percentile of 63%. The highest average AFQT percentile was found in sailors who enrolled in DL classes, with an average of almost 65%. If the AFQT is a good proxy for ability, this tells us that sailors enrolled in TA may have higher ability levels.

Other notable descriptive statistics were that female, African-American, and Hispanic sailors participated in TA at higher rates than their counterparts. Appendix B shows that women and minorities typically promote at lower rates than their male and Caucasian male counterparts. Thus, they may enroll in TA at higher rates to improve chances of promotion. Also, sailors who are married or have dependents tend to enroll in TA at higher rates than their single counterparts with no dependents.

These descriptive statistics do not provide a causal link between demographics, the TA program, and retention, but rather provide a snapshot of the tendencies of the 1994 through 2004 cohorts. Section D will develop the multivariate statistical models to estimate the effect of the various demographic and TA variables on retention.

D. MULTIVARIATE MODELS

This section discusses the multivariate model specification used to estimate the effect of TA on the retention of sailors in their first enlistment term. This section will also investigate whether the effect of TA on retention differs by method of instruction. Explanatory variables, estimation methodology used to obtain unbiased program effects, and respective effects on promotion in the first-term enlistment will be discussed in depth.

Prior research conducted by Buddin and Kapur (2005) and Mehay and Pema (2009) agree that sailors who enroll in the TA program are significantly different than those who do not. The descriptive statistics in Table 12 indicate that sailors enrolled in the TA program have higher AFQT scores, on average, than sailors who do not enroll in the program. In order to eliminate bias that may be present in the sample, the unobserved errors must be uncorrelated with both retention and course enrollment behavior.

Controlling for motivation and ability in particular, is very important for unbiasedness of the estimated program effects. The following probit model specification was used to estimate the effect of enrolling in the TA program on retention:

$$\begin{aligned} &\boldsymbol{P}(\boldsymbol{y}_i = 1 \mid \boldsymbol{TA}, \boldsymbol{X}, \boldsymbol{A}) = \Phi(\boldsymbol{TA}_i + \boldsymbol{\beta X}_i + \boldsymbol{\gamma A}_i + \boldsymbol{u}_i) \\ &\boldsymbol{i} = 1, ..., \boldsymbol{N} \end{aligned} \tag{4}$$

where y_i represents the dependent variable (reenlistment or extension). X_i represents demographic variables such as race, gender, marital status, and dependents, as well as occupational and cohort dummies, and A_i represents the individuals AFQT score to control for unobserved individual characteristics.

Although the AFQT works as a good proxy for ability, there may be some unobserved characteristics such as discipline, motivation or initiative that cause sailors to positively select into the TA program. To remove systematic differences between TA participants and nonparticipants the sample is restricted to only TA participants to reveal their propensity for further education. Equation 5 uses the same explanatory variables as Equation 4, but restricts the database to only those sailors who enrolled in the TA program. It then estimates the effect of passing at least one TA class on retention, compared to those sailors who do not pass a TA class.

$$\begin{aligned} &\boldsymbol{P}(\boldsymbol{y}_i = 1 \mid \boldsymbol{PassTA}, \boldsymbol{X}, \boldsymbol{A}) = \Phi(\boldsymbol{PassTA}_i + \boldsymbol{\beta X}_i + \boldsymbol{\gamma A}_i + \boldsymbol{u}_i) \\ &\boldsymbol{i} = 1, ..., \boldsymbol{N} \end{aligned} \tag{5}$$

After estimating the effect of TA on retention and passing a TA class on retention, it is important to determine if the effect of TA on retention differs by method of instruction. Equation 6 restricts the database to only those sailors who enrolled in the TA program and estimates the effect of enrolling in DL classes on retention, compared to sailors who never enrolled in a DL course.

$$\begin{aligned} &\boldsymbol{P}(\boldsymbol{y}_i = 1 \mid \boldsymbol{DL}, \boldsymbol{X}, \boldsymbol{A}) = \Phi(\boldsymbol{DL}_i + \boldsymbol{\beta X}_i + \boldsymbol{\gamma A}_i + \boldsymbol{u}_i) \\ &\boldsymbol{i} = 1, ..., \boldsymbol{N} \end{aligned} \tag{6}$$

The last multivariate retention model compares sailors who pass at least one DL class to those who enroll in DL and do not pass at least one class. Equation 7 determines the estimated effect of passing a DL class, as compared to sailors who enroll, but do not

successfully complete. This model assumes that sailors who enroll in DL and successfully complete courses are different from those sailors who enroll, but do not complete their courses.

$$P(y_i = 1 \mid PassDL, X, A) = \Phi(PassDL_i + \beta X_i + \gamma A_i + u_i)$$
$$i = 1, ..., N \tag{7}$$

E. RESULTS

The key results of the first-term reenlistment model are displayed in Table 13, with the full regression results found in Appendix D. The first column of Table 13 represents the estimated effect of TA on retention. The second column represents the restriction of the dataset to only sailors who enrolled in the TA program. The last column represents the restriction of the dataset to only sailors who enrolled in DL classes. The rows of the table represent the estimated effects of Equations 4 through 7.

Table 13. Probit Reenlistment Model Results

Reenlist Prior to End of First Term						
	Full Sample		TA Users[a]		DL Users[b]	
	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
Enrolled in a TA course	0.719 (0.007)***	0.278	-	-	-	-
Pass at least one TA course[c]	-	-	0.353 (0.017)***	0.139	-	-
Enrolled in a DL course[d]	-	-	0.639 (0.012)***	0.242	-	-
Passed at least one DL course[e]	-	-	-	-	0.382 (0.021)***	0.135
Observations	200,209	200,209	60,050	60,050	28,507	28,507
Robust Standard Errors in Parentheses * significant at 10%; ** significant at 5%; *** significant at 1%						

[a]Sample restricted to only sailors that ever enrolled in TA program
[b]Sample restricted to only sailors that ever enrolled in DL classes
[c]Control group is sailors that enroll in TA program, but do not pass at least one class
[d]Control group is users that enroll in TA program, but not DL courses
[e]Control group is users that enroll in DL courses, but do not pass at least one class

Table 14 provides the effect of TA on extension of sailors past their EAOS without reenlisting. Again, the full regression results can be found in Appendix E. Table 14 can be read in the same way as Table 10, and provides an insight to the effect of TA by method of instruction on extension for sailors finishing their first enlistment term.

Table 14. Extension Probit Multivariate Model Results

Extend Past First Term Without Reenlisting						
	Full Sample		TA Users[a]		DL Users[b]	
	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
Enrolled in a TA course	-0.205 (0.007)***	-0.063 (0.002)**	-	-	-	-
Pass at least one TA course[c]	-	-	-0.157 (0.017)***	-0.051 (0.006)***	-	-
Enrolled in a DL course[d]	-	-	-0.328 (0.012)***	-0.100 (0.004)***		
Passed at least one DL course[e]	-	-	-	-	-0.222 (0.022)***	-0.063 (0.007)***
Observations	200,184	200,184	60,050	60,050	28,507	28,507
Robust Standard Errors in Parentheses * significant at 10%; ** significant at 5%; *** significant at 1%						

[a]Sample restricted to only sailors that ever enrolled in TA program
[b]Sample restricted to only sailors that ever enrolled in DL classes
[c]Control group is sailors that enroll in TA program, but do not pass at least one class
[d]Control group is users that enroll in TA program, but not DL courses
[e]Control group is users that enroll in DL courses, but do not pass at least one class

Overall, sailors who utilize the TA program reenlist at much higher rates than those who do not enroll in the TA program. Sailors who enroll in DL classes reenlist at even higher rates than those who enroll in traditional classes. Conversely, sailors who enroll in the TA program extend past their EAOS without reenlisting at lower rates than those who do not utilize the TA program.

1. The Estimated Effect of TA by Method of Instruction on Reenlistment

A probit model develops a baseline probability of reenlistment from all of the observations and determines what the effect of TA would be on reenlistment, with all other characteristics about the sailor held constant. A sailor who enrolls in TA during their first enlistment term is 27.8 percentage points more likely to reenlist, compared to those who never enroll in the TA program. This difference is likely inflated by unobserved differences not captured in the AFQT score, therefore it is better to compare those who enroll in the TA program, and draw references from differences between those who increase their human capital (i.e., pass a class) and those who do not.

When restricting the sample to only those who enrolled in the TA program, those sailors who passed at least one class were 13.9 percentage points more likely to reenlist than sailors who did not pass at least one class. This demonstrates that although sailors

who enroll in the TA program are different between those who do not, sailors who do not complete at least one class may not be very different from those who never enroll. Chances are they enrolled in a course without researching how it would impact their job and personal life, and choose to not enroll in any more courses.

Table 14 shows that method of instruction chosen is important when determining the effect of TA on reenlistment. Sailors who enroll in a DL class are 24.2 percentage points more likely to reenlist as compared to sailors who enroll in traditional courses. Sailors who successfully pass at least one DL course are 13.5 percentage points more likely to reenlist than sailors who unsuccessfully enrolled in DL classes. This may be attributed to a number of factors. The NCPDLP program is highly advertised to sailors interested in enrolling in the TA program. It is structured to give sailors a chance to earn a degree that is related to their rating (although not required) which would further their professional knowledge. The program is geared to set sailors up for success by providing them with a support network and ensuring that they do not have to pay out-of-pocket expenses.

2. The Estimated Effect of TA by Method of Instruction on Extension

Table 14 shows that sailors who enroll in the TA program are 6.3 percentage points less likely to extend their enlistment, than sailors who do not enroll in the TA program. This is likely due to the high reenlistment rates of sailors who utilize the TA program. Sailors who pass at least one class are 5.1 percentage points less likely to extend than sailors who enroll in a TA class, but do not successfully complete it. As with the reenlistment results, this suggests that sailors who do not pass at least one class are not very different from sailors who never enroll in the TA program.

Again, as with reenlistment, the method of instruction impacts the likelihood of extension of first-term sailors. Sailors who enroll in DL classes are 10 percentage points less likely to extend as compared to sailors who enroll in traditional classes. Sailors who pass at least one DL class are 6.3 percentage points less likely to extend than sailors who enroll in DL, but do not pass at least one class. These results are consistent with the descriptive statistics of the dataset provided in Table 12.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This thesis analyzes the effect of participating in the TA program in three main areas:

- Success and GPA of TA participants.
- Effect of TA on promotion in the first and second enlistment term.
- Effect of TA on retention of first-term sailors.

This study also analyzes whether the effect of TA differs by method of instruction (DL versus traditional), or is a product of unobserved individual characteristics of sailors who choose to enroll in DL versus traditional classes.

1. Course Success and GPA of TA Participants

The first area explored was the effect of enrolling in DL classes on course success and the GPA of TA program participants. Students who enroll in DL classes are 10.7 percentage points less likely to successfully complete a course than their counterparts who enrolled in traditional style TA classes. The results clearly indicate a positive correlation between pay grade and course success. The course success model does not take into account sailors who withdrew from classes due to work or family responsibilities and, therefore, was limited in its ability to adequately address only the effect of the method of instruction.

A GPA model was introduced to eliminate sailors who withdrew from classes and only take into account final results of DL classes. In this case, the results show that a student enrolled in a DL class generally receives a grade that is 0.42, or almost half a letter grade, lower than a student who enrolls in a traditional class. This result agrees with Stephenson et al. (2005), who estimated the negative effects of DL to be as high as two letter grades for students with SAT scores below 1,000.

2. Effect of TA on Promotion

The second area explored in this thesis was the effect of enrolling in the TA program on promotion in first- and second-term sailors. TA has the largest effect on promotion from E3 to E4 and, as sailors become more senior in the Navy, those who continue to stay become more homogeneous. This signals that there is something different about a sailor who enrolls in TA classes, and this is especially evident in sailors who enroll in classes in the year(s) in which they are eligible for promotion. The difficulty of taking classes during off-duty time demonstrates that sailors who do enroll in TA classes may have higher ability and motivation levels than those who do not enroll in TA.

A sailor who enrolls in TA sometime during their first enlistment term is 6 percentage points more likely to get promoted to E4, compared to those who never enroll in the TA program. Sailors who enroll in the TA program in the year(s) in which they are eligible for promotion are 17 percentage points more likely to get promoted to E4 than sailors who never enrolled in a TA class. Sailors who enroll in TA classes sometime during their first enlistment term are 4 percentage points more likely to get promoted to E5 and are 6.4 percentage points more likely to get promoted to E5 if they enrolled in a TA class in the year in which they were eligible for promotion.

In the second term of service, the effect of enrolling in the TA program is smaller and indicates a 2.1 percentage point difference in promotion to E6 if enrolled in TA sometime during the term. There is less than a 1 percentage point difference in promotion to E6 if they enrolled in the TA program during the year in which the sailor was eligible for promotion.

Sailors who enroll strictly in DL classes sometime during their first enlistment are 7.7 percentage points less likely to be promoted to E4 than those who enroll in traditional classes. However, the time frame in which sailors choose to enroll in DL classes is an important indicator. Those sailors who enroll in DL classes in the year in which they are eligible for promotion are 24.2 percentage points more likely to be promoted than sailors enrolled in traditional classes. What this shows is that the Navy prizes the skills and

maturity demonstrated by sailors enrolling in DL classes. Sailors who enroll in DL classes in the years in which they are eligible for promotion are different from sailors who enroll in traditional classes.

As with the effect of enrolling in the TA program, the effect of the method of instruction declines as sailors become more senior. Second-term sailors who enroll in DL classes are 4 percentage points more likely to be promoted to E6 than those who enroll in traditional classes, and sailors who enroll in DL classes in the year in which they are eligible for promotion are not statistically different from those who enroll in TA classes. This again demonstrates that sailors become more homogeneous as they become more senior in rank. Sailors who choose DL classes appear to do so because DL classes are more convenient to integrate into busy work and home demands. The results do not necessarily indicate that sailors taking DL are significantly different from those who choose traditional classroom methods.

3. Effect of TA on Retention of First-Term Sailors

The last area explored in this thesis was the effect of TA by method of instruction on the retention of first-term sailors. Retention is broken down into the two areas of reenlistment and extension. An ISC of 1100 in the enlisted master file defines reenlistment, while extension is defined as staying in the Navy past the EAOS (greater than 50 months) without reenlisting. Overall, sailors who utilize the TA program reenlist at much higher rates than those who do not enroll in the TA program. Sailors who enroll in DL classes reenlist at even higher rates than those who enroll in traditional classes. Conversely, sailors who enroll in the TA program extend past their EAOS without reenlisting at lower rates than those who do not utilize the TA program.

A sailor who enrolls in TA during their first enlistment term is 27.8 percentage points more likely to reenlist, compared to those who never enroll in the TA program. When restricting the sample to only those who enrolled in the TA program, those sailors who passed at least one class were 13.9 percentage points more likely to reenlist than sailors who did not pass at least one class. Sailors who enroll in a DL class are 24.2 percentage points more likely to reenlist, as compared to sailors who enroll in traditional

courses. Sailors who successfully pass at least on DL course are 13.5 percentage points more likely to reenlist than sailors who unsuccessfully enrolled in DL classes.

Sailors who enroll in the TA program are 6.3 percentage points less likely to extend than sailors who do not enroll in the TA program. Sailors who pass at least one class are 5.1 percentage points less likely to extend than sailors who enroll in a TA class, but do not successfully complete it. Sailors who enroll in DL classes are 10 percentage points less likely to extend, as compared to sailors who enroll in traditional classes. Sailors who pass at least one DL class are 6.3 percentage points less likely to extend than sailors who enroll in DL, but do not pass at least one class.

This demonstrates that although sailors who enroll in the TA program are different from those who do not, sailors who do not complete at least one class may not be very different from those who never enroll. Therefore, the causal effects are less biased when more similar groups are compared, (i.e., those who passed against those who did not) rather than those who enrolled in the TA program versus those who did not. Chances are they enrolled in a course without researching how it would impact their job and personal life, and choose to not enroll in any more courses. The chosen method of instruction is important when determining the effect of TA on reenlistment, which may be attributed to a number of factors. The NCPDLP program is highly advertised to sailors interested in enrolling in the TA program. It is set up to give sailors a chance to earn a degree that is related to their rating (although not required) and to further their professional knowledge. The program is geared to set sailors up for success by providing them with a support network and ensuring that they do not have to pay out-of-pocket expenses.

B. RECOMMENDATIONS

This thesis has explored the effect of the TA program on promotion and retention of sailors in the Navy. Although it is large and costly, the TA program appears to yield positive benefits for sailors and the Navy. A Navy quick poll, conducted in 2006, found that a clear majority of sailors in pay grades E2 through E7 felt that "Educational opportunities in the Navy positively impact my decision to make the navy a career"

(Uriell, Patrissi, Newell, & Whittam, 2006). The NCPDLP and other DL programs demonstrate even larger returns on promotion and retention for those sailors who enroll in, and successfully complete, DL classes.

Although large, positive benefits are generated for students who successfully complete TA classes, students who enroll, but do not complete classes, tend to be very similar to students who never enroll in the TA program. In order to utilize the program effects on promotion and retention to the fullest, it is recommended that a more rigorous screening process be implemented when sailors are interested in signing up for the TA program. In addition to academic standards required by the educational institution, work and home demands need to be more carefully scrutinized prior to allowing a sailor into the TA program. This is especially true with DL classes, as much more self-discipline is required in these flexible programs. Many young sailors are unrealistic about how much time is required to successfully complete TA courses outside of normal working hours.

Along the lines of the Navy mentorship program, sailors accepted into their first class in the TA program should be paired with sailors who have successfully completed classes, in order to help develop strong study habits. Many times, some guidance and motivation from knowledgeable and successful senior sailors is all that is required to help a struggling sailor through a class and on a path to successful educational attainment.

The following areas are recommended for further research on the TA program:

- Compare the effect on retention and promotion of the Navy's TA program to other branches of the DoD. The Navy runs the smallest program and may benefit from successful controls implemented by other branches of the military.
- Conduct a cost-benefit analysis of the TA program. Develop estimates of the value of the TA program in monetary terms and compare the monetary benefits to the cost of the program to determine the net economic returns.
- Explore the effect of incurring obligations for sailors after their second enlistment term. The effects of the TA program largely drop off as sailors become more senior and provide less return to the Navy.

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APPENDIX A. FULL COURSE SUCCESS AND GPA MULTIVARIATE REGRESSION RESULTS

Dependent Variable: Grade Point Average		
Explanatory Variable	Coefficient (Standard Error)	
	Course Success	Grade Point Average
DL Course	-0.107	-0.45
	(0.009)***	(0.026)***
Course Taken 1995	-0.025	-0.044
	(0.004)***	(0.013)***
Course Taken 1996	-0.041	-0.056
	(0.004)***	(0.014)***
Course Taken 1997	-0.04	-0.027
	(0.004)***	(0.014)*
Course Taken 1998	-0.049	-0.004
	(0.004)***	-0.014
Course Taken 1999	-0.069	0.01
	(0.004)***	-0.015
Course Taken 2000	-0.068	0.061
	(0.005)***	(0.015)***
Course Taken 2001	-0.08	0.086
	(0.005)***	(0.015)***
Course Taken 2002	-0.079	0.097
	(0.005)***	(0.016)***
Course Taken 2003	-0.08	0.132
	(0.005)***	(0.016)***
Course Taken 2004	-0.076	0.155
	(0.005)***	(0.016)***
Course Taken 2005	-0.079	0.153
	(0.005)***	(0.017)***
Course Taken 2006	-0.076	0.192
	(0.006)***	(0.018)***
Course Taken 2007	-0.091	0.164
	(0.006)***	(0.018)***

Dependent Variable: Grade Point Average		
Explanatory Variable	Coefficient (Standard Error)	
	Course Success	Grade Point Average
Business class	0.005	-0.063
	(0.002)**	(0.007)***
History class	-0.001	-0.116
	-0.002	(0.008)***
Math class	-0.045	-0.301
	(0.002)***	(0.008)***
Natural Sciences class	-0.015	-0.177
	(0.002)***	(0.008)***
Physical Sciences class	-0.048	-0.234
	(0.003)***	(0.010)***
IT class	0.006	-0.004
	(0.002)***	-0.007
Humanities class	0.007	-0.028
	(0.002)***	(0.007)***
English class	0.005	-0.065
	(0.002)**	(0.007)***
Misc class	0	0
	0	0
Medical class	0.015	-0.025
	(0.003)***	(0.009)***
Vocational class	0.016	0.039
	(0.003)***	(0.009)***
Law or Criminal Justice	0.033	0.065
	(0.003)***	(0.009)***
Paygrade of E4	0.013	0.095
	(0.002)***	(0.007)***
Paygrade of E5	0.03	0.166
	(0.003)***	(0.009)***
Paygrade of E6	0.043	0.167
	(0.004)***	(0.012)***

Dependent Variable: Grade Point Average		
Explanatory Variable	Coefficient (Standard Error)	
	Course Success	Grade Point Average
Paygrade of E7	0.066	0.152
	(0.005)***	(0.016)***
Paygrade of E8	0.076	0.14
	(0.007)***	(0.021)***
Paygrade of E9	0.095	0.116
	(0.010)***	(0.032)***
Interaction DL and Business	0.013	0.202
	(0.007)*	(0.020)***
Interaction DL and History	-0.023	0.139
	(0.007)***	(0.022)***
Interaction DL and Math	0	0.16
	-0.007	(0.022)***
Interaction DL and Natural Sciences	0.007	0.213
	-0.007	(0.021)***
Interaction DL and Physical Sciences	0	0.037
	0	-0.028
Interaction DL and IT	0.015	0.303
	(0.007)**	(0.021)***
Interaction DL and Humanities	0.014	0.181
	(0.007)**	(0.020)***
Interaction DL and English	-0.008	0.167
	-0.007	(0.021)***
Interaction DL and Misc	0.016	0.227
	(0.008)**	(0.024)***

Dependent Variable: Grade Point Average		
Explanatory Variable	Coefficient (Standard Error)	
	Course Success	Grade Point Average
Interaction DL and Medical	0.013	0.302
	(0.008)*	(0.023)***
Interaction DL and Vocational	0.007	0
	-0.008	0
Interaction DL and Law or Criminal Justice	-0.007	0.153
	-0.008	(0.023)***
Interaction DL and E4	0.002	-0.002
	-0.006	-0.018
Interaction DL and E5	0.015	-0.021
	(0.006)**	-0.018
Interaction DL and E6	0.026	-0.014
	(0.006)***	-0.019
Interaction DL and E7	0.041	0.027
	(0.006)***	-0.02
Interaction DL and E8	0.053	0.037
	(0.008)***	-0.024
Interaction DL and E9	0.048	0.051
	(0.011)***	-0.035
Constant	0.93	3.097
	(0.005)***	(0.016)***
Observations	1,296,287	1,173,107
Number of Individuals	216,346	200,740
* significant at 10%; ** significant at 5%; *** significant at 1%		

APPENDIX B. FULL FIRST-TERM ENLISTMENT MULTIVARIATE REGRESSION RESULTS

	Promotion to E4				Promotion to E5			
	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible
Ever take TA course (1=yes)	0.06	0.176	-	-	0.04	0.064	-	-
	(0.003)***	(0.006)***	-	-	(0.002)***	(0.005)***	-	-
Enrolled in Only DL Courses	-	-	-0.077	0.242	-	-	0.082	0.177
	-	-	(0.022)***	(0.038)***	-	-	(0.014)***	(0.026)***
Marriage status in year 1-4 of enlistment	0.025	0.009	0.031	0.035	-0.005	-0.02	-0.001	-0.002
	(0.002)***	(0.003)***	(0.015)**	-0.023	(0.001)***	(0.003)***	-0.007	-0.018
# of dependents in year 1-4 of enlistment	0.049	0.295	0.049	0.405	0.04	0.13	0.058	0.117
	(0.002)***	(0.005)***	(0.021)**	(0.033)***	(0.001)***	(0.004)***	(0.012)***	(0.021)***
Interaction of marriage and dependents	-0.01	0.008	-0.044	-0.049	0.003	0.012	0.006	0.014
	(0.002)***	(0.004)*	(0.019)**	-0.03	(0.001)***	(0.004)***	-0.011	-0.019
Special Operations	0.551	0.639	0.696	0.565	-0.017	-0.104	0.102	0.133
	(0.015)***	(0.032)***	(0.216)***	(0.284)**	(0.008)**	(0.026)***	-0.198	-0.261
Instructor	0.315	1.076	0.16	0	0.168	0.282	-0.256	0.177
	(0.022)***	(0.072)***	-0.158	0	(0.020)***	(0.052)***	-0.229	-0.535
Combat Systems	0.443	0.662	0.464	0.889	0.04	-0.176	0.193	0.567
	(0.007)***	(0.016)***	(0.164)***	(0.153)***	(0.004)***	(0.056)***	-0.153	-0.395
Aviation	0.191	0.062	0.103	-0.112	0.004	0.027	0.004	-0.009
	(0.002)***	(0.009)***	(0.036)***	-0.117	(0.001)***	-0.018	-0.015	-0.145
Seaman	0.042	-0.105	-0.005	-0.179	-0.006	0.115	-0.007	0.285
	(0.002)***	(0.008)***	-0.032	-0.113	(0.001)***	(0.020)***	-0.014	-0.226
Security	0.276	0.35	0.242	0.213	0.032	0.076	0.05	0.1
	(0.014)***	(0.035)***	(0.139)*	-0.284	(0.008)***	-0.048	-0.064	-0.13
Communications	0.306	0.412	0.368	-0.118	0.012	-0.044	-0.088	0.105
	(0.003)***	(0.011)***	(0.085)***	-0.199	(0.002)***	(0.011)***	(0.046)*	-0.129
Damage Control	0.312	1.132	-0.333	0	0.088	0.027	-0.065	0.001
	(0.007)***	(0.019)***	-0.241	0	(0.003)***	(0.016)*	-0.114	-0.009
Missile Tech	0.37	0.57	0.297	0	0.041	-0.027	0.029	0
	(0.005)***	(0.014)***	-0.217	0	(0.002)***	(0.015)*	-0.103	0

	Promotion to E4				Promotion to E5			
	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible
Sonar Tech	0.294	0.719	0.386	1.083	0.098	0.25	0.047	0.172
	(0.006)***	(0.017)***	-0.31	(0.183)***	(0.004)***	(0.022)***	-0.144	-0.23
Information Tech	0.366	0.598	0.584	0.497	0.016	-0.099	-0.037	0.177
	(0.004)***	(0.012)***	(0.059)***	(0.133)***	(0.002)***	(0.017)***	-0.042	-0.14
Radar Tech	0.35	0.573	0.452	0.544	0.077	0.114	0.094	0.278
	(0.003)***	(0.010)***	(0.075)***	(0.138)***	(0.002)***	(0.018)***	(0.043)**	(0.140)**
Intelligence	0.343	0.517	0.328	0.257	0.084	0.432	0.04	0.442
	(0.009)***	(0.026)***	(0.107)***	-0.275	(0.006)***	(0.066)***	-0.079	-0.282
Operations specialist	0.281	0.215	0.35	-0.119	0.002	-0.013	0.05	0.206
	(0.011)***	(0.029)***	(0.123)***	-0.176	-0.006	-0.04	-0.065	-0.198
Medical	0.16	0.102	0.227	0.056	-0.012	0.217	-0.002	0.319
	(0.002)***	(0.010)***	(0.049)***	-0.12	(0.001)***	(0.046)***	-0.013	-0.302
Photography	0.268	0.229	-0.105	-1.179	0.031	-0.271	-0.011	0
	(0.026)***	(0.057)***	-0.285	(0.113)***	(0.012)***	-0.193	-0.014	0
Meteorology	0.328	0.387	0.185	0.331	0.045	-0.018	0.009	0.022
	(0.011)***	(0.029)***	-0.149	(0.195)*	(0.005)***	-0.113	-0.021	-0.122
Musician	0.233	0.364	0.04	-0.372	0.038	0.097	0.019	0
	(0.016)***	(0.049)***	-0.203	(0.174)**	(0.008)***	(0.043)**	-0.04	0
Administrative clerk	0.372	0.684	0.486	0.696	0.087	0.302	0.132	0.463
	(0.005)***	(0.013)***	(0.049)***	(0.121)***	(0.003)***	(0.023)***	(0.027)***	(0.143)***
Supply Clerk	0.414	0.561	0.555	0.497	0.02	-0.08	0.037	-0.416
	(0.004)***	(0.011)***	(0.058)***	(0.125)***	(0.002)***	(0.044)*	-0.029	-0.315
Postal Clerk	0.529	0.677	0.67	0.469	0.006	0.285	-0.028	0
	(0.015)***	(0.026)***	(0.185)***	(0.192)**	-0.005	(0.110)***	-0.027	0
Religious Program Specialist	0.462	0.689	0.455	0.491	0.007	-0.051	-0.031	-0.175
	(0.020)***	(0.031)***	(0.192)**	(0.230)**	-0.007	-0.16	-0.019	(0.024)***
SeaBee Engineer	0.23	0.363	0.14	0.334	0.021	0.086	0.129	-0.823
	(0.005)***	(0.018)***	-0.136	-0.225	(0.002)***	(0.022)***	-0.133	(0.026)***
Interior Communications	0.36	0.633	0.553	-0.179	0.032	0.074	0.015	-0.003
	(0.007)***	(0.022)***	(0.324)*	-0.113	(0.004)***	(0.034)**	-0.058	-0.19
Ordinance	0.265	0.288	0.298	0.037	-0.003	-0.07	-0.006	-0.086
	(0.006)***	(0.017)***	(0.157)*	-0.294	-0.002	(0.031)**	-0.06	-0.214
Machinist Mate	0.364	0.485	0.145	0.028	0.001	-0.025	0.021	-0.039
	(0.005)***	(0.011)***	(0.080)*	-0.153	-0.002	(0.011)**	-0.028	-0.167

	Promotion to E4				Promotion to E5			
	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible
Nuclear	-0.105	0.441	0.296	-1.008	0.216	0.337	0.058	0.151
	(0.006)***	(0.013)***	-0.305	(0.155)***	(0.003)***	(0.007)***	(0.029)**	-0.12
Machinery Repair	0.37	0.833	0.294	0.888	0.087	0.206	0.097	0.646
	(0.010)***	(0.029)***	-0.243	(0.117)***	(0.007)***	(0.054)***	-0.319	(0.314)**
Electrician's Mate	0.255	0.281	0.512	0.382	-0.001	-0.444	-0.109	-1.825
	(0.012)***	(0.035)***	(0.267)*	-0.255	-0.005	(0.157)***	-0.114	(0.031)***
Parachute Rigger	0.437	0.747	0.54	0.594	0.041	-0.064	-0.004	-0.383
	(0.005)***	(0.012)***	(0.170)***	(0.272)**	(0.003)***	-0.055	-0.127	-0.392
Culinary Specialist	0.319	0.539	0.177	-0.135	0.001	0.105	0.045	0.299
	(0.005)***	(0.018)***	-0.165	-0.395	-0.002	(0.042)**	-0.051	(0.129)**
Ship Servicemen	0.501	0.864	1.57	1.497	0.006	-0.092	0.036	0
	(0.015)***	(0.033)***	(0.058)***	(0.125)***	-0.005	(0.048)*	-0.029	0
Master at Arms	0.437	0.683	0.484	0.803	0.109	0.065	0.065	0.035
	(0.010)***	(0.023)***	(0.121)***	(0.267)***	(0.007)***	-0.047	-0.067	-0.197
Observations	800,844	395,945	37,682	22,874	800,844	273,662	37,682	18,907
Number of Individuals	200,211	172,883	26,746	17,970	200,211	148,821	26,746	15,388

Robust Standard Errors in Parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

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APPENDIX C. FULL SECOND-TERM ENLISTMENT MULTIVARIATE REGRESSION RESULTS

	Promotion to E5				Promotion to E6			
	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible
Ever take TA course (1=yes)	-0.107	-0.107	-	-	0.021	0.003	-	-
	(0.003)***	(0.003)***	-	-	(0.002)***	(0.001)***	-	-
Enrolled in Only DL Courses	-	-	-0.1	-0.1	-	-	0.04	0.003
	-	-	(0.012)***	(0.012)***	-	-	(0.008)***	-0.003
Marriage status in year 1-4 of enlistment	-0.077	-0.077	-0.085	-0.085	0.018	0.008	0.029	-0.001
	(0.006)***	(0.006)***	(0.015)***	(0.015)***	(0.002)***	(0.001)***	(0.009)***	-0.002
# of dependents in year 1-4 of enlistment	-0.013	-0.013	-0.092	-0.092	0.003	0.002	0.03	0
	(0.002)***	(0.002)***	(0.009)***	(0.009)***	(0.001)***	(0.001)***	(0.005)***	-0.001
Interaction of marriage and dependents	-0.014	-0.014	0.023	0.023	0.002	-0.001	-0.006	0.001
	(0.003)***	(0.003)***	(0.008)***	(0.008)***	(0.001)*	(0.001)*	-0.005	-0.001
Special Operations	-0.372	-0.372	-0.154	-0.154	0.088	0.002	-0.009	0
	(0.030)***	(0.030)***	-0.149	-0.149	(0.015)***	-0.004	-0.115	-0.001
Instructor	-0.409	-0.409	-0.186	-0.186	0.081	-0.002	0.157	-0.001
	(0.036)***	(0.036)***	-0.272	-0.272	(0.025)***	(0.001)*	-0.149	-0.002
Combat Systems	-0.167	-0.167	0.201	0.201	0.1	0.004	-0.18	-0.001
	(0.027)***	(0.027)***	-0.175	-0.175	(0.016)***	-0.005	-0.141	-0.001
Aviation	-0.148	-0.148	-0.086	-0.086	0.062	-0.001	0.068	0
	(0.006)***	(0.006)***	(0.024)***	(0.024)***	(0.003)***	(0.001)***	(0.016)***	-0.001
Seaman	-0.125	-0.125	-0.064	-0.064	0.058	0.001	0.068	0.001
	(0.006)***	(0.006)***	(0.024)***	(0.024)***	(0.004)***	-0.001	(0.017)***	-0.001
Security	-0.295	-0.295	-0.084	-0.084	0.085	0	0.096	0.001
	(0.030)***	(0.030)***	-0.128	-0.128	(0.015)***	-0.001	-0.094	-0.004
Communications	-0.285	-0.285	-0.161	-0.161	0.085	0.007	0.098	0.008
	(0.009)***	(0.009)***	(0.030)***	(0.030)***	(0.006)***	(0.002)***	(0.029)***	-0.008
Damage Control	-0.331	-0.331	0.034	0.034	0.168	-0.003	0.061	0.002
	(0.022)***	(0.022)***	-0.095	-0.095	(0.015)***	-0.002	-0.072	-0.003
Missile Tech	-0.208	-0.208	-0.057	-0.057	0.101	0.001	0.058	0
	(0.012)***	(0.012)***	-0.04	-0.04	(0.008)***	-0.002	-0.052	-0.001

	Promotion to E5				Promotion to E6			
	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible
Sonar Tech	-0.311	-0.311	-0.127	-0.127	0.1	-0.002	0.115	-0.001
	(0.013)***	(0.013)***	(0.058)**	(0.058)**	(0.009)***	(0.000)***	(0.061)*	-0.001
Information Tech	-0.283	-0.283	-0.221	-0.221	0.103	0.002	0.089	0.002
	(0.011)***	(0.011)***	(0.042)***	(0.042)***	(0.007)***	-0.002	(0.038)**	-0.002
Radar Tech	-0.334	-0.334	-0.169	-0.169	0.089	-0.001	0.039	0
	(0.009)***	(0.009)***	(0.032)***	(0.032)***	(0.006)***	-0.001	-0.034	-0.001
Intelligence	-0.353	-0.353	-0.166	-0.166	0.169	0.009	0.081	0
	(0.032)***	(0.032)***	-0.101	-0.101	(0.026)***	-0.012	-0.121	-0.001
Operations specialist	-0.313	-0.313	-0.305	-0.305	0.194	0.008	0.22	-0.001
	(0.033)***	(0.033)***	(0.078)***	(0.078)***	(0.024)***	-0.01	(0.065)***	-0.001
Medical	0.064	0.064	0.09	0.09	0.019	0	0.01	-0.001
	(0.009)***	(0.009)***	(0.026)***	(0.026)***	(0.002)***	-0.002	(0.005)*	-0.001
Photography	-0.05	-0.05	0.47	0.47	0.027	0	0.007	0
	-0.076	-0.076	-0.449	-0.449	-0.027	-0.001	-0.041	-0.001
Meteorology	-0.333	-0.333	-0.4	-0.4	0.101	0.012	0.036	0
	(0.032)***	(0.032)***	(0.119)***	(0.119)***	(0.030)***	-0.013	-0.148	0
Musician	-0.191	-0.191	-0.501	-0.501	-0.147	-0.003	-0.299	0.002
	(0.056)***	(0.056)***	(0.261)*	(0.261)*	(0.040)***	(0.001)**	-0.263	-0.002
Administrative clerk	-0.144	-0.144	-0.161	-0.161	0.05	0.003	0.07	0.009
	(0.013)***	(0.013)***	(0.039)***	(0.039)***	(0.005)***	-0.002	(0.022)***	-0.01
Supply Clerk	-0.183	-0.183	-0.167	-0.167	0.045	-0.002	0.061	0
	(0.012)***	(0.012)***	(0.042)***	(0.042)***	(0.005)***	(0.001)***	(0.021)***	-0.001
Postal Clerk	-0.255	-0.255	-0.429	-0.429	0.039	0.016	0.056	0.001
	(0.057)***	(0.057)***	(0.178)**	(0.178)**	(0.018)**	-0.015	-0.045	-0.002
Religious Program Specialist	-0.077	-0.077	-0.251	-0.251	0.093	-0.002	0.073	0.001
	-0.071	-0.071	-0.234	-0.234	(0.035)***	(0.001)**	-0.059	-0.001
SeaBee Engineer	-0.139	-0.139	-0.138	-0.138	0.06	0.005	0.036	0
	(0.015)***	(0.015)***	(0.063)**	(0.063)**	(0.007)***	-0.004	-0.039	-0.001
Interior Communications	-0.077	-0.077	-0.098	-0.098	0.047	0	0.141	0
	(0.029)***	(0.029)***	-0.084	-0.084	(0.014)***	-0.001	-0.098	-0.002
Ordinance	-0.112	-0.112	-0.119	-0.119	0.057	0.001	0.078	0
	(0.019)***	(0.019)***	-0.114	-0.114	(0.009)***	-0.004	-0.073	0
Machinist Mate	-0.117	-0.117	-0.035	-0.035	0.038	-0.001	0.035	0.001
	(0.012)***	(0.012)***	-0.048	-0.048	(0.007)***	-0.002	-0.031	-0.001

	Promotion to E5				Promotion to E6			
	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible	Promote	Promote if Eligible	Promote if Enrolled in DL Class	Promote if Enrolled in DL Class and Eligible
Nuclear	-0.334	-0.334	-0.166	-0.166	0.007	0.002	-0.082	0
	(0.005)***	(0.005)***	(0.033)***	(0.033)***	-0.012	-0.003	-0.058	-0.001
Machinery Repair	-0.196	-0.196	-0.188	-0.188	0.045	-0.002	0.09	-0.001
	(0.029)***	(0.029)***	-0.155	-0.155	(0.010)***	-0.001	-0.057	-0.001
Electrician's Mate	-0.1	-0.1	-0.163	-0.163	0.025	-0.002	0.002	0
	(0.046)**	(0.046)**	-0.166	-0.166	(0.010)***	(0.001)***	-0.009	0
Parachute Rigger	-0.125	-0.125	-0.152	-0.152	0.066	-0.001	0.138	0
	(0.022)***	(0.022)***	-0.121	-0.121	(0.010)***	-0.004	-0.084	-0.001
Culinary Specialist	0.019	0.019	0.04	0.04	0.014	-0.006	0.049	-0.001
	-0.016	-0.016	-0.089	-0.089	(0.004)***	-0.004	-0.032	-0.001
Ship Servicemen	-0.098	-0.098	-0.159	-0.159	0.026	0.009	0.078	-0.001
	(0.038)***	(0.038)***	-0.214	-0.214	(0.009)***	-0.012	-0.06	-0.001
Master at Arms	-0.325	-0.325	-0.093	-0.093	0.136	0.012	-0.034	-0.003
	(0.041)***	(0.041)***	-0.182	-0.182	(0.025)***	-0.012	-0.102	-0.002
Observations	295,709	295,709	38,477	38,477	295,709	122,560	38,477	17,253
Number of SSN	73,928	73,928	22,375	22,375	73,928	34,634	22,375	10,308

Robust Standard Errors in Parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

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APPENDIX D. REENLISTMENT MULTIVARIATE REGRESSION RESULTS

		Full Sample		TA Users		TA Users		DL Users	
		Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
Program Effect	Enrolled in a TA course	0.719 (0.007)***	0.278	-	-	-	-	-	-
	Pass at least one TA course[c]	-	-	0.353 (0.017)***	0.139	-	-	-	-
	Enrolled in a DL course[d]	-	-	-	-	0.639 (0.012)***	0.242	-	-
	Passed at least one DL course[e]	-	-	-	-	-	-	0.382 (0.021)***	0.135
Demographic	Black	0.241 (0.009)***	0.094	0.205 (0.016)***	0.078	0.203 (0.016)***	0.077	0.151 (0.025)***	0.049
	Native American	0.048 (0.018)***	0.019	0.115 (0.035)***	0.044	0.107 (0.035)***	0.041	0.06 -0.05	0.02
	Asian	0.253 (0.014)***	0.099	0.212 (0.023)***	0.08	0.239 (0.023)***	0.089	0.103 (0.037)***	0.033
	Other	0.071 (0.042)*	0.027	-0.085 -0.068	-0.033	-0.06 -0.069	-0.023	0.044 -0.115	0.014
	Unknown	-0.092 -0.06	-0.035	-0.155 -0.11	-0.061	-0.129 -0.11	-0.05	-0.214 -0.158	-0.075
	Hispanic	0.03 (0.010)***	0.012	0.014 -0.017	0.005	0.04 (0.017)**	0.016	0.008 -0.027	0.003
	Female	-0.249 (0.009)***	-0.092	-0.262 (0.013)***	-0.103	-0.281 (0.013)***	-0.11	-0.27 (0.020)***	-0.093
	Marriage status at end of first enlistment	0.056 (0.010)***	0.021	0.033 (0.018)*	0.013	0.02 -0.018	0.008	-0.004 -0.027	-0.001
	# of dependents end of first enlistment	0.182 (0.009)***	0.07	0.18 (0.016)***	0.07	0.154 (0.016)***	0.06	0.165 (0.025)***	0.055
	Interaction of marriage and dependents	-0.045 (0.011)***	-0.017	-0.04 (0.020)**	-0.015	-0.032 -0.02	-0.012	-0.04 -0.031	-0.013
	Age at end of enlistment	0.019 (0.001)***	0.007	0.005 (0.002)**	0.002	0.005 (0.002)**	0.002	-0.003 -0.003	-0.001

		Full Sample		TA Users		TA Users		DL Users	
		Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
Education Level	Non H.S. diploma Graduate	0.044 (0.013)***	0.017	0.011 -0.026	0.004	0.005 -0.027	0.002	0.05 -0.043	0.016
	General Equivalency Diploma	-0.013 -0.018	-0.005	0.044 -0.036	0.017	0.039 -0.036	0.015	0.062 -0.056	0.02
	Some college, no degree	-0.062 (0.022)***	-0.024	-0.089 (0.040)**	-0.035	-0.107 (0.041)***	-0.042	-0.086 -0.061	-0.03
	Completad 2 year degree	-0.083 (0.022)***	-0.031	-0.126 (0.043)***	-0.05	-0.093 (0.044)**	-0.036	-0.145 (0.067)**	-0.05
	AFQT percentile	-0.003 (0.000)***	-0.001	-0.006 (0.000)***	-0.002	-0.007 (0.000)***	-0.003	-0.008 (0.001)***	-0.003
Occupation	Special Operations	0.497 (0.059)***	0.196	0.124 -0.105	0.047	0.105 -0.107	0.04	0.053 -0.167	0.017
	Instructor	-0.022 -0.08	-0.008	0.172 -0.148	0.065	0.164 -0.148	0.062	-0.167 -0.215	-0.059
	Combat Systems	-0.016 -0.029	-0.006	-0.139 (0.065)**	-0.055	-0.14 (0.066)**	-0.055	-0.171 (0.104)*	-0.06
	Aviation	0.024 (0.013)*	0.009	-0.142 (0.029)***	-0.055	-0.089 (0.030)***	-0.034	-0.087 (0.048)*	-0.03
	Seaman	0.058 (0.017)***	0.022	0.028 -0.038	0.011	0.034 -0.039	0.013	0.037 -0.063	0.012
	Security	-0.404 (0.059)***	-0.142	-0.892 (0.087)***	-0.338	-0.875 (0.089)***	-0.333	-0.889 (0.137)***	-0.339
	Communications	0.182 (0.017)***	0.071	-0.016 -0.034	-0.006	-0.013 -0.034	-0.005	-0.115 (0.053)**	-0.04
	Damage Control	0.409 (0.026)***	0.161	0.232 (0.052)***	0.087	0.186 (0.053)***	0.07	-0.017 -0.075	-0.006
	Missile Tech	0.225 (0.022)***	0.088	0.085 (0.044)*	0.033	0.056 -0.045	0.021	-0.032 -0.067	-0.011
	Sonar Tech	0.354 (0.021)***	0.14	0.21 (0.043)***	0.079	0.172 (0.044)***	0.065	0.152 (0.065)**	0.049
	Information Tech	-0.004 -0.018	-0.002	-0.178 (0.034)***	-0.07	-0.206 (0.035)***	-0.081	-0.214 (0.053)***	-0.075

		Full Sample		TA Users		TA Users		DL Users	
		Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
Occupation	Radar Tech	0.143 (0.015)***	0.056	-0.012 -0.032	-0.005	-0.04 -0.032	-0.015	-0.079 -0.05	-0.027
	Intelligence	0.066 (0.035)*	0.025	-0.069 -0.057	-0.027	-0.111 (0.058)*	-0.044	-0.152 (0.082)*	-0.053
	Operations specialist	0.026 -0.041	0.01	-0.175 (0.063)***	-0.069	-0.199 (0.065)***	-0.078	-0.21 (0.096)**	-0.074
	Medical	-0.173 (0.015)***	-0.065	-0.507 (0.029)***	-0.2	-0.452 (0.030)***	-0.178	-0.408 (0.048)***	-0.147
	Photography	0 -0.099	0	-0.122 -0.171	-0.048	-0.069 -0.177	-0.027	0.306 -0.326	0.092
	Meteorology	-0.06 -0.041	-0.023	-0.327 (0.062)***	-0.129	-0.376 (0.064)***	-0.149	-0.335 (0.091)***	-0.122
	Musician	0.378 (0.074)***	0.149	-0.349 (0.142)**	-0.138	-0.288 (0.144)**	-0.114	-0.194 -0.24	-0.068
	Administrative clerk	0.204 (0.018)***	0.08	-0.004 -0.033	-0.001	0.003 -0.033	0.001	0.09 (0.053)*	0.029
	Supply Clerk	0.172 (0.018)***	0.067	0.07 (0.037)*	0.027	0.103 (0.038)***	0.039	0.11 (0.061)*	0.036
	Postal Clerk	-0.023 -0.053	-0.009	-0.102 -0.092	-0.04	-0.132 -0.094	-0.052	-0.11 -0.144	-0.038
	Religious Program Specialist	-0.021 -0.061	-0.008	-0.297 (0.081)***	-0.117	-0.272 (0.082)***	-0.107	-0.194 -0.132	-0.068
	SeaBee Engineer	0.196 (0.021)***	0.077	-0.155 (0.044)***	-0.061	-0.121 (0.045)***	-0.047	-0.059 -0.074	-0.02
	Interior Communications	-0.177 (0.035)***	-0.066	-0.092 -0.076	-0.036	-0.136 (0.077)*	-0.053	-0.179 -0.112	-0.063
	Ordinance	0.119 (0.023)***	0.046	-0.038 -0.053	-0.015	0.007 -0.054	0.003	0.114 -0.091	0.037
	Machinist Mate	-0.149 (0.022)***	-0.056	-0.111 (0.050)**	-0.043	-0.111 (0.051)**	-0.043	-0.036 -0.081	-0.012
	Nuclear	0.836 (0.017)***	0.323	0.513 (0.037)***	0.182	0.446 (0.037)***	0.16	0.258 (0.055)***	0.08
	Machinery Repair	0.033 -0.036	0.013	0.068 -0.081	0.026	0.119 -0.082	0.045	0.135 -0.144	0.043
	Electrician's Mate	0.037 -0.053	0.014	-0.229 (0.085)***	-0.09	-0.199 (0.087)**	-0.078	-0.143 -0.145	-0.05

		Full Sample		TA Users		TA Users		DL Users	
		Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
	Parachute Rigger	-0.118 (0.023)***	-0.044	-0.053 -0.057	-0.021	-0.056 -0.058	-0.022	-0.133 -0.091	-0.046
	Culinary Specialist	0.225 (0.021)***	0.088	0.132 (0.049)***	0.05	0.166 (0.050)***	0.062	0.126 -0.083	0.041
	Ship Servicemen	0.059 -0.048	0.023	0.154 -0.11	0.058	0.19 (0.112)*	0.071	0.328 (0.199)*	0.098
	Master at Arms	-0.029 -0.039	-0.011	-0.17 (0.062)***	-0.067	-0.217 (0.063)***	-0.085	-0.195 (0.084)**	-0.069
Cohort	1995 Cohort	0.033 (0.015)**	0.013	0.012 -0.026	0.005	-0.006 -0.027	-0.002	-0.159 (0.051)***	-0.055
	1996 Cohort	0.197 (0.014)***	0.077	0.121 (0.026)***	0.046	0.087 (0.026)***	0.033	-0.095 (0.049)*	-0.032
	1997 Cohort	0.291 (0.016)***	0.114	0.253 (0.028)***	0.095	0.2 (0.029)***	0.075	-0.028 -0.051	-0.01
	1998 Cohort	0.335 (0.014)***	0.131	0.169 (0.025)***	0.064	0.08 (0.026)***	0.031	-0.207 (0.047)***	-0.072
	1999 Cohort	0.224 (0.014)***	0.087	0.028 -0.025	0.011	-0.081 (0.025)***	-0.031	-0.435 (0.046)***	-0.156
	2000 Cohort	0.018 -0.014	0.007	-0.206 (0.025)***	-0.081	-0.343 (0.026)***	-0.135	-0.729 (0.046)***	-0.269
	2001 Cohort	-0.174 (0.015)***	-0.065	-0.558 (0.027)***	-0.22	-0.708 (0.028)***	-0.276	-1.112 (0.048)***	-0.418
	2002 Cohort	-1.167 (0.021)***	-0.331	-1.692 (0.041)***	-0.54	-1.866 (0.042)***	-0.569	-2.295 (0.062)***	-0.704
	2003 Cohort	-1.284 (0.067)***	-0.339	-1.812 (0.131)***	-0.545	-2.03 (0.131)***	-0.573	-2.395 (0.184)***	-0.698
	2004 Cohort	0.892 (0.271)***	0.341	-	-	-	-	-	-
	Observations	200,209	200,209	60,050	60,050	60,050	60,050	28,507	28,507
	Robust Standard Errors in Parentheses * significant at 10%; ** significant at 5%; *** significant at 1%								

APPENDIX E. EXTENSION MULTIVARIATE REGRESSION RESULTS

		Full Sample		'98 Cohort		'00 Cohort		'02 Cohort	
		Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
Program Effect	Enrolled in a TA course	-0.095 (0.017)***	-0.043	-	-	-	-	-	-
	Passed at least one TA course	-	-	-0.132 (0.017)***	-0.051	-	-	-	-
	Enrolled in a T1 course	-	-	-	-	-0.235 (0.018)***	-0.1	-	-
	Passed at least one T1 course	-	-	-	-	-	-	-0.228 (0.028)***	-0.043
Demographic	Black	-0.035 (0.009)***	-0.016	-0.081 (0.017)***	-0.035	-0.075 (0.017)***	-0.033	-0.085 (0.026)***	-0.017
	Native American	-0.017 -0.019	-0.005	-0.081 (0.036)**	-0.035	-0.075 (0.036)**	-0.033	-0.004 -0.038	-0.022
	Asian	-0.104 (0.014)***	-0.022	-0.121 (0.024)***	-0.041	-0.147 (0.024)***	-0.043	-0.047 -0.029	-0.012
	Other	-0.016 -0.045	-0.005	-0.025 -0.075	-0.007	-0.026 -0.075	-0.011	-0.044 -0.123	-0.011
	Unknown	0.009 -0.017	0.002	0.027 -0.105	0.012	0.022 -0.105	0.01	0.008 -0.115	0.002
	Hispanic	-0.023 (0.010)**	-0.007	-0.005 -0.018	-0.002	-0.017 -0.018	-0.005	0.022 -0.026	0.004
	Female	0.17 (0.009)***	0.054	0.181 (0.014)***	0.068	0.189 (0.014)***	0.06	0.194 (0.021)***	0.054
	Marriage status at end of first enlistment	-0.017 -0.011	-0.005	-0.019 -0.019	-0.006	-0.01 -0.019	-0.003	0.013 -0.026	0.004
	# of dependents end of first enlistment	-0.115 (0.010)***	-0.037	-0.145 (0.017)***	-0.045	-0.11 (0.017)***	-0.04	-0.14 (0.026)***	-0.037
	Interaction of marriage and dependents	0.051 (0.012)***	0.016	0.031 -0.025	0.01	0.028 -0.022	0.009	0.026 -0.032	0.007
	Age at end of enlistment	0.004 (0.001)***	0.002	0.004 (0.002)*	0.001	0.004 (0.002)*	0.001	0.007 (0.004)**	0.002

		Full Sample		2k Users		3k Users		5k Users	
		Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
Education Level	Non H.S. diploma graduate	0 -0.014	0	0.037 -0.026	0.012	0.037 -0.026	0.012	-0.001 -0.044	0
	General Equivalency Diploma	0.061 (0.019)***	0.026	0.013 -0.028	0.004	0.014 -0.028	0.004	0.026 -0.026	0.007
	Some college, no degree	0.049 (0.02)**	0.016	0.057 -0.041	0.018	0.062 -0.041	0.02	0.08 -0.064	0.022
	Completed 2 year degree	0.03 -0.022	0.01	0.081 (0.045)*	0.026	0.083 -0.045	0.02	0.119 (0.065)*	0.031
	AFQT percentile	0.008 (0.002)***	0.003	0.007 (0.002)***	0.002	0.008 (0.002)***	0.002	0.008 (0.001)***	0.002
Occupation	Special Operations	0.198 (0.06)***	0.058	0.021 -0.11	0.006	0.047 -0.114	0.013	0.198 -0.17	0.043
	Instructor	0.577 (0.075)***	0.211	0.19 -0.13	0.063	0.201 -0.149	0.065	0.482 (0.212)**	0.154
	Combat Systems	-0.086 (0.031)***	-0.026	0.011 -0.075	0.003	0.009 -0.078	0.003	0.177 -0.118	0.051
	Aviation	0.054 (0.014)***	0.017	0.031 -0.031	0.01	0.004 -0.032	0.001	0.071 -0.052	0.019
	Gunner	-0.031 (0.016)***	-0.016	-0.08 (0.04)**	-0.026	-0.087 (0.04)**	-0.026	0.019 -0.065	0.005
	Security	0.562 (0.016)***	0.201	0.548 (0.036)***	0.195	0.531 (0.036)***	0.189	0.57 (0.148)***	0.185
	Communications	0.313 (0.017)***	0.109	0.172 (0.026)***	0.056	0.174 (0.026)***	0.056	0.281 (0.026)***	0.084
	Damage Control	0.499 (0.026)***	0.18	0.199 (0.033)***	0.062	0.189 (0.034)***	0.062	0.3 (0.077)***	0.09
	Missile Tech	0.291 (0.022)***	0.106	0.184 (0.046)***	0.06	0.204 (0.047)***	0.067	0.256 (0.078)***	0.076
	Sonar Tech	0.2 (0.021)***	0.068	0.041 -0.046	0.014	0.072 -0.046	0.021	0.081 -0.067	0.022
	Information Tech	0.137 (0.016)***	0.041	0.101 (0.027)***	0.031	0.117 (0.027)***	0.037	0.217 (0.037)***	0.062

		Full Sample		2% Users		3% Users		5% Users	
		Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
Occupation	Radar Tech	0.117 (0.016)***	0.037	0.092 (0.014)*	0.021	0.082 (0.015)**	0.026	0.149 (0.013)***	0.042
	Intelligence	-0.105 (0.015)***	-0.033	-0.086 -0.063	-0.026	-0.051 -0.054	-0.016	0.121 -0.086	0.031
	Operations Specialist	0.017 -0.045	0.005	-0.053 -0.072	-0.016	-0.045 -0.073	-0.014	-0.035 -0.111	-0.009
	Medical	1.031 (0.015)***	0.321	0.921 (0.011)***	0.322	0.901 (0.011)***	0.322	0.799 (0.011)***	0.24
	Photography	-0.217 (0.113)**	-0.074	-0.278 -0.21	-0.076	-0.309 -0.218	-0.094	-0.309 -0.276	-0.071
	Meteorology	0.099 (0.044)**	0.032	0.168 (0.037)**	0.051	0.189 (0.037)***	0.062	0.294 (0.037)***	0.071
	Musician	-0.062 -0.079	-0.021	0.342 (0.144)**	0.117	0.367 (0.144)**	0.124	0.31 -0.242	0.091
	Administrative Clerk	0.021 0.019	0.007	-0.024 0.016	-0.007	-0.025 0.016	-0.008	-0.036 0.017	-0.009
	Supply Clerk	-0.075 (0.028)***	-0.024	-0.141 (0.042)***	-0.041	-0.133 (0.042)***	-0.045	-0.072 -0.046	-0.019
	Postal Clerk	0.03 -0.035	0.01	-0.106 -0.106	-0.032	-0.095 -0.106	-0.029	-0.023 -0.104	-0.006
	Religious Program Specialist	0.144 (0.056)**	0.048	0.161 (0.057)*	0.053	0.149 (0.056)*	0.048	0.287 (0.117)**	0.084
	Seabee Engineer	0.765 (0.021)***	0.281	0.528 (0.045)***	0.188	0.512 (0.045)***	0.181	0.344 (0.076)***	0.104
	Interior Communications	0.056 (0.035)*	0.019	0.054 -0.068	0.018	0.061 -0.068	0.021	0.254 (0.117)**	0.071
	Ordinance	-0.148 (0.026)***	-0.043	-0.173 (0.041)***	-0.05	-0.197 (0.041)***	-0.066	-0.229 (0.105)**	-0.057
	Machinist Mate	0.057 (0.024)**	0.018	-0.034 -0.037	-0.013	-0.035 -0.037	-0.012	-0.014 -0.09	-0.004
	Nuclear	0.236 (0.018)***	0.08	-0.014 -0.029	-0.004	0.029 -0.029	0.009	0.161 (0.027)***	0.044
	Machinery Repair	0.138 (0.035)***	0.044	-0.031 -0.09	-0.011	-0.074 -0.091	-0.022	-0.077 -0.116	-0.02

		Full Sample		2R Users		2R Users		OL Users	
		Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect	Coefficient (Standard Error)	Marginal Effect
Occupation	Electrician's Mate	0.681 (0.011)***	0.131	0.627 (0.005)***	0.227	0.616 (0.006)***	0.221	0.438 (0.143)***	0.137
	Parachute Rigger	-0.01 0.025	-0.009	-0.005 0.025	-0.026	-0.001 0.025	-0.024	0.002 0.1	0.022
	Culinary Specialist	0.09 (0.023)***	0.029	-0.126 (0.015)**	-0.037	-0.142 (0.015)***	-0.042	-0.132 -0.093	-0.036
	Ship Serviceman	0.064 -0.052	0.019	-0.117 -0.123	-0.035	-0.121 -0.124	-0.036	-0.023 -0.201	-0.006
	Master at Arms	0.43 (0.014)***	0.151	0.189 (0.015)***	0.062	0.209 (0.015)***	0.069	0.218 (0.088)***	0.061
Cohort	1996 Cohort	-0.01 (0.015)**	-0.01	-0.046 -0.026	-0.014	-0.035 -0.029	-0.011	0.184 (0.013)**	0.029
	1996 Cohort	-0.111 (0.015)***	-0.034	-0.113 (0.026)***	-0.034	-0.093 (0.026)***	-0.026	0.053 -0.031	0.015
	1997 Cohort	-0.162 (0.017)***	-0.049	-0.174 (0.010)***	-0.057	-0.148 (0.011)***	-0.049	-0.049 -0.034	-0.013
	1998 Cohort	-0.071 (0.015)***	-0.022	-0.08 (0.027)***	-0.024	-0.028 -0.027	-0.01	0.161 (0.049)***	0.046
	1999 Cohort	0.014 -0.014	0.004	0.071 (0.027)***	0.022	0.127 (0.027)***	0.04	0.36 (0.048)***	0.106
	2000 Cohort	0.111 (0.014)***	0.037	0.198 (0.027)***	0.064	0.267 (0.027)***	0.088	0.572 (0.048)***	0.177
	2001 Cohort	0.229 (0.015)***	0.077	0.397 (0.029)***	0.136	0.469 (0.029)***	0.163	0.807 (0.050)***	0.268
	2002 Cohort	0.371 (0.017)***	0.129	0.681 (0.034)***	0.248	0.758 (0.034)***	0.274	1.188 (0.055)***	0.422
	2003 Cohort	-1.234 (0.066)***	-0.232	-1.085 (0.135)***	-0.206	-1.009 (0.135)***	-0.197	-0.513 (0.188)***	-0.106
	Observations	369,161	369,161	66,826	66,826	66,826	66,826	38,687	38,687

Robust Standard Errors in Parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

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